HIGHLIGHTS

REVISION NO. 33 Jun 01/10

Pages which have been revised are outlined below, together with the Highlights of the Revision

CH/SE/SU C PAGES	REASON FOR CHANGE	EFFECTIVITY
CHAPTER 72		
L.E.P. 1- 7	Revised to Reflect this revision indicating new,revised, and/or deleted pages	
T. OF C. 1- 9	Revised to reflect this revision	
72-00-00 612, 623, 626- 628, 633- 636, 639, 655- B652	Effectivity updated at the bottom of the page Minor additions and amplification SUPERSEDED CTE7181 BY CTE6181. ADDED CRIMPER PWA105181 AND CORRESPONDING ILLUSTRATION. DELETED WORD "OUTBOARD" IN ORDER TO PUT CHOCKS IN FRONT OF EACH FORWARD MLG WHEELS. Layout improved	
72-00-00 722- 724	Minor, non technical corrections CORRECTED TYPO ERROR. Minor additions and amplification ADDED PROPRIETARY ECOPOWER (R) ENGINE GASPATH CLEANING AS AN ALTERNATE PROCEDURE TO STD. WATER WASH.	
72-21-02 601, 610- 618, 621- 622	Effectivity updated at the bottom of the page Layout improved	
72-32-02 801	Minor additions and amplification REVISED REPAIR PROCEDURE CONCERNING IN-SITU BLEND REPAIR OF 5TH THRU 15TH STAGE BLADES.	
72-58-01 601- 602, 605- 608, 610, 612	Minor additions and amplification REVISED FIG."TURBINE EXHAUST CASE REGULAR INTERVAL INSPECTION MAXIMUM DAMAGE".	
72-65-02 401- 402	Minor additions and amplification ADDED THE REMOVAL/INSTALLATION OF THE MAIN OIL FILTER HOSE AND TUBE ASSEMBLY.	

CH/SE/SU C PAGES	REASON FOR CHANGE	EFFECTIVITY
	ADDED THE MENTIONS "IF NECESSARY" AND "IF REMOVED".	

CHAPTER 72

ENGINE

LIST OF EFFECTIVE PAGES

N, R or D indicates pages which are New, Revised or Deleted respectively
Remove and insert the affected pages and complete the Record of Revisions and the Record of Temporary Revisions as necessary

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RECORD OF TEMP. REVISION			
L.E.P.	R	1- 7	Jun01/10
T. of C.	R	1	Jun01/10
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T. of C.	R	8	Jun01/10
T. of C.	R	9	Jun01/10
72-00-00		1	Jun01/04
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72-00-00		624	Jun01/06
72-00-00		625	Jun01/06
72-00-00	R	626	Jun01/10
72-00-00	R	627	Jun01/10
72-00-00	R	628	Jun01/10
72-00-00		629	Jun01/09
72-00-00		630	Jun01/06
72-00-00		631	Jun01/06
72-00-00		632	Jun01/06
72-00-00	R	633	Jun01/10

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72-00-00	R	634	Jun01/10	72-00-00	R	685	Jun01/10	72-00-00	R	A636	Jun01/10
72-00-00	R	635	Jun01/10	72-00-00	R	686	Jun01/10	72-00-00	R	A637	Jun01/10
72-00-00	R	636	Jun01/10	72-00-00	R	687	Jun01/10	72-00-00	R	A638	Jun01/10
72-00-00		637	Jun01/09	72-00-00	R	688	Jun01/10	72-00-00	R	A639	Jun01/10
72-00-00		638	Jun01/07	72-00-00	R	689	Jun01/10	72-00-00	R	A640	Jun01/10
72-00-00	R	639	Jun01/10	72-00-00	R	690	Jun01/10	72-00-00	R	A641	Jun01/10
72-00-00		640	Jun01/07	72-00-00	R	691	Jun01/10	72-00-00	R	A642	Jun01/10
72-00-00		641	Jun01/07	72-00-00	R	692	Jun01/10	72-00-00	R	A643	Jun01/10
72-00-00		642	Jun01/07	72-00-00	R	693	Jun01/10	72-00-00	R	A644	Jun01/10
72-00-00		643	Jun01/07	72-00-00	R	694	Jun01/10	72-00-00	R	A645	Jun01/10
72-00-00		644	Jun01/07	72-00-00	R	695	Jun01/10	72-00-00	R	A646	Jun01/10
72-00-00		645	Jun01/07	72-00-00	R	696	Jun01/10	72-00-00	R	A647	Jun01/10
72-00-00		646	Jun01/07	72-00-00	R	697	Jun01/10	72-00-00	R	A648	Jun01/10
72-00-00		647	Jun01/07	72-00-00	R	698	Jun01/10	72-00-00	R	A649	Jun01/10
72-00-00		648	Jun01/07	72-00-00	R	699	Jun01/10	72-00-00	R	A650	Jun01/10
72-00-00		649	Jun01/07	72-00-00	R	A600	Jun01/10	72-00-00	R	A651	Jun01/10
72-00-00		650	Jun01/07	72-00-00	R	A601	Jun01/10	72-00-00	R	A652	Jun01/10
72-00-00		651	Jun01/07	72-00-00	R	A602	Jun01/10	72-00-00	R	A653	Jun01/10
72-00-00		652	Jun01/07	72-00-00	R	A603	Jun01/10	72-00-00	R	A654	Jun01/10
72-00-00		653	Jun01/07	72-00-00	R	A604	Jun01/10	72-00-00	R	A655	Jun01/10
72-00-00		654	Jun01/07	72-00-00	R	A605	Jun01/10	72-00-00	R	A656	Jun01/10
72-00-00	R	655	Jun01/10	72-00-00	R	A606	Jun01/10	72-00-00	R	A657	Jun01/10
72-00-00	R	656	Jun01/10	72-00-00	R	A607	Jun01/10	72-00-00	R	A658	Jun01/10
72-00-00	R	657	Jun01/10	72-00-00	R	A608	Jun01/10	72-00-00	R	A659	Jun01/10
72-00-00	R	658	Jun01/10	72-00-00	R	A609	Jun01/10	72-00-00	R	A660	Jun01/10
72-00-00	R	659	Jun01/10	72-00-00	R	A610	Jun01/10	72-00-00	R	A661	Jun01/10
72-00-00	R	660	Jun01/10	72-00-00	R	A611	Jun01/10	72-00-00	R	A662	Jun01/10
72-00-00	R	661	Jun01/10	72-00-00	R	A612	Jun01/10	72-00-00	R	A663	Jun01/10
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72-00-00	R	663	Jun01/10	72-00-00	R	A614	Jun01/10	72-00-00	R	A665	Jun01/10
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72-00-00	R	665	Jun01/10	72-00-00	R	A616	Jun01/10	72-00-00	R	A667	Jun01/10
72-00-00	R	666	Jun01/10	72-00-00	R	A617	Jun01/10	72-00-00	R	A668	Jun01/10
72-00-00	R	667	Jun01/10	72-00-00	R	A618	Jun01/10	72-00-00	R	A669	Jun01/10
72-00-00	R	668	Jun01/10	72-00-00	R	A619	Jun01/10	72-00-00	R	A670	Jun01/10
72-00-00	R	669	Jun01/10	72-00-00	R	A620	Jun01/10	72-00-00	R	A671	Jun01/10
72-00-00	R	670	Jun01/10	72-00-00	R	A621	Jun01/10	72-00-00	R	A672	Jun01/10
72-00-00	R	671	Jun01/10	72-00-00	R	A622	Jun01/10	72-00-00	R	A673	Jun01/10
72-00-00	R	672	Jun01/10	72-00-00	R	A623	Jun01/10	72-00-00	R	A674	Jun01/10
72-00-00	R	673	Jun01/10	72-00-00	R	A624	Jun01/10	72-00-00	R	A675	Jun01/10
72-00-00	R	674	Jun01/10	72-00-00	R	A625	Jun01/10	72-00-00	R	A676	Jun01/10
72-00-00	R	675	Jun01/10	72-00-00	R	A626	Jun01/10	72-00-00	R	A677	Jun01/10
72-00-00	R	676	Jun01/10	72-00-00	R	A627	Jun01/10	72-00-00	R	A678	Jun01/10
72-00-00	R	677	Jun01/10	72-00-00	R	A628	Jun01/10	72-00-00	R	A679	Jun01/10
72-00-00	R	678	Jun01/10	72-00-00	R	A629	Jun01/10	72-00-00	R	A680	Jun01/10
72-00-00	R	679	Jun01/10	72-00-00	R	A630	Jun01/10	72-00-00	R	A681	Jun01/10
72-00-00	R	680	Jun01/10	72-00-00	R	A631	Jun01/10	72-00-00	R	A682	Jun01/10
72-00-00	R	681	Jun01/10	72-00-00	R	A632	Jun01/10	72-00-00	R	A683	Jun01/10
72-00-00	R	682	Jun01/10	72-00-00	R	A633	Jun01/10	72-00-00	R	A684	Jun01/10
72-00-00	R	683	Jun01/10	72-00-00	R	A634	Jun01/10	72-00-00	R	A685	Jun01/10
72-00-00	R	684	Jun01/10	72-00-00	R	A635	Jun01/10	72-00-00	R	A686	Jun01/10

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72-00-00	R	A688	Jun01/10	72-00-00	R	B639	Jun01/10	72-21-01		601	Jun01/04
72-00-00	R	A689	Jun01/10	72-00-00	R	B640	Jun01/10	72-21-01		602	Jun01/08
72-00-00	R	A690	Jun01/10	72-00-00	R	B641	Jun01/10	72-21-01		603	Jun01/04
72-00-00	R	A691	Jun01/10	72-00-00	R	B642	Jun01/10	72-21-01		801	Jun01/04
72-00-00	R	A692	Jun01/10	72-00-00	R	B643	Jun01/10	72-21-01		802	Jun01/04
72-00-00	R	A693	Jun01/10	72-00-00	R	B644	Jun01/10	72-21-01		803	Jun01/04
72-00-00	R	A694	Jun01/10	72-00-00	R	B645	Jun01/10	72-21-01		804	Jun01/04
72-00-00	R	A695	Jun01/10	72-00-00	R	B646	Jun01/10	72-21-01		805	Jun01/04
72-00-00	R	A696	Jun01/10	72-00-00	R	B647	Jun01/10	72-21-01		806	Jun01/04
72-00-00	R	A697	Jun01/10	72-00-00	R	B648	Jun01/10	72-21-01		807	Jun01/05
72-00-00	R	A698	Jun01/10	72-00-00	R	B649	Jun01/10	72-21-01		808	Jun01/04
72-00-00	R	A699	Jun01/10	72-00-00	N	B650	Jun01/10	72-21-01		809	Jun01/05
72-00-00	R	B600	Jun01/10	72-00-00	N	B651	Jun01/10	72-21-01		810	Jun01/05
72-00-00	R	B601	Jun01/10	72-00-00	N	B652	Jun01/10	72-21-02		201	Jun01/04
72-00-00	R	B602	Jun01/10	72-00-00		701	Jun01/06	72-21-02		202	Jun01/04
72-00-00	R	B603	Jun01/10	72-00-00		702	Jun01/06	72-21-02		203	Jun01/04
72-00-00	R	B604	Jun01/10	72-00-00		703	Jun01/06	72-21-02		204	Jun01/04
72-00-00	R	B605	Jun01/10	72-00-00		704	Jun01/06	72-21-02		205	Jun01/04
72-00-00	R	B606	Jun01/10	72-00-00		705	Jun01/06	72-21-02		401	Jun01/08
72-00-00	R	B607	Jun01/10	72-00-00		706	Jun01/06	72-21-02		402	Jun01/08
72-00-00	R	B608	Jun01/10	72-00-00		707	Jun01/06	72-21-02		403	Jun01/08
72-00-00	R	B609	Jun01/10	72-00-00		708	Jun01/06	72-21-02		404	Jun01/08
72-00-00	R	B610	Jun01/10	72-00-00		709	Jun01/06	72-21-02		405	Jun01/08
72-00-00	R	B611	Jun01/10	72-00-00		710	Jun01/06	72-21-02		406	Jun01/08
72-00-00	R	B612	Jun01/10	72-00-00		711	Jun01/06	72-21-02		407	Jun01/08
72-00-00	R	B613	Jun01/10	72-00-00		712	Jun01/06	72-21-02		408	Jun01/04
72-00-00	R	B614	Jun01/10	72-00-00		713	Jun01/06	72-21-02		409	Jun01/04
72-00-00	R	B615	Jun01/10	72-00-00		714	Jun01/06	72-21-02		410	Jun01/04
72-00-00	R	B616	Jun01/10	72-00-00		715	Jun01/06	72-21-02		411	Jun01/04
72-00-00	R	B617	Jun01/10	72-00-00		716	Jun01/06	72-21-02		412	Dec01/06
72-00-00	R	B618	Jun01/10	72-00-00		717	Jun01/06	72-21-02	R	601	Jun01/10
72-00-00	R	B619	Jun01/10	72-00-00		718	Jun01/06	72-21-02		602	Dec01/06
72-00-00	R	B620	Jun01/10	72-00-00		719	Jun01/06	72-21-02		603	Dec01/06
72-00-00	R	B621	Jun01/10	72-00-00		720	Jun01/06	72-21-02		604	Jun01/04
72-00-00	R	B622	Jun01/10	72-00-00		721	Jun01/06	72-21-02		605	Jun01/04
72-00-00	R	B623	Jun01/10	72-00-00	R	722	Jun01/10	72-21-02		606	Jun01/04
72-00-00	R	B624	Jun01/10	72-00-00	N	723	Jun01/10	72-21-02		607	Jun01/04
72-00-00	R	B625	Jun01/10	72-00-00	N	724	Jun01/10	72-21-02		608	Dec01/06
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72-00-00	R	B628	Jun01/10	72-20-00		2	Jun01/04	72-21-02	R	611	Jun01/10
72-00-00	R	B629	Jun01/10					72-21-02	R	612	Jun01/10
72-00-00	R	B630	Jun01/10	72-21-00		1	Jun01/04	72-21-02	R	613	Jun01/10
72-00-00	R	B631	Jun01/10	72-21-00		2	Jun01/04	72-21-02	R	614	Jun01/10
72-00-00	R	B632	Jun01/10	72-21-00		3	Jun01/04	72-21-02	R	615	Jun01/10
72-00-00	R	B633	Jun01/10	72-21-00		4	Jun01/04	72-21-02	R	616	Jun01/10
72-00-00	R	B634	Jun01/10	72-21-00		5	Jun01/04	72-21-02	R	617	Jun01/10
72-00-00	R	B635	Jun01/10	72-21-01		401	Jun01/09	72-21-02	R	618	Jun01/10
72-00-00	R	B636	Jun01/10	72-21-01		402	Jun01/09	72-21-02		619	Jun01/04
72-00-00	R	B637	Jun01/10	72-21-01		403	Jun01/04	72-21-02		620	Jun01/04

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72-21-02	R	621	Jun01/10
72-21-02	R	622	Jun01/10
72-21-02		801	Jun01/04
72-21-02		802	Jun01/04
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72-23-01		401	Jun01/04
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Repair Cone (Front) Segment Bolt Pocket Corner Damage			807	101-200,
FIRST STAGE COMPRESSOR ROTOR (FAN) BLADE ASSEMBLY	72-21-02			
Maintenance Practices			201	101-200,
Lubricate the Mid-Span shrouds of Blades			201	101-200,
Lubrication of the Stage 1 LPC (Fan) Blade Roots to Reduce N1 Vibration			202	101-200,
Removal/Installation			401	101-200,
Individual or a Matched Moment Weighed Set of Stage 1 LPC (Fan) Blades			401	101-200,
All Stage 1 LPC (Fan) Blades			404	101-200,
Inspection/Check			601	101-200,
Inspect First Stage Compressor Rotor (Fan) Blade (General Instructions)			601	101-200,
Inspect First Stage Compressor (Fan) Blade Airfoil for Surface Damage and Cracks (Detailed Visual Inspection, Part I)			602	101-200,
Inspect First Stage Compressor (Fan) Blade Part Span Shroud (Detailed Visual Inspection, Part II)			605	101-200,
			605	101-200,
Inspect First Stage Compressor (Fan) Blade Part Span Shroud (Detailed Visual Inspection, Part II)			608	101-105,
			608	101-105,
Inspect First Stage Compressor (Fan) Blade Airfoil For Bends and Curl (Detailed Visual Inspection, Part III)			610	101-200,
Inspect First Stage Compressor (Fan) Blade Platform (Detailed Visual Inspection, Part IV)			610	101-200,
Inspect First Stage Compressor (Fan) Blade Root (Detailed Visual Inspection, Part V)			611	101-200,
Use Fluorescent Penetrant to Inspect the First Stage Compressor (Fan) Blade Airfoil and Shroud for			618	101-200,

SUBJECT	CH/SE/SU	C	PAGE	EFFECTIVITY
Cracks				
Use Eddy Current to Examine the First Stage Compressor (Fan) Blade Leading and Trailing Edges			618	101-200,
Approved Repairs			801	101-200,
Blend Repair Blade Airfoil			801	101-200,
Replace Stage 1 (Fan) Blade Rubber seal			807	101-200,
Restore Stage 1 (Fan) Blade Assembly Leading Edge Contour			818	101-200,
FAN EXIT FAIRING	72-21-03			
Removal/Installation			401	101-200,
Inspection/Check			601	101-200,
Inspect Fan Exit Fairing			601	101-200,
STAGE 1.6 LPC BLADE	72-21-05			
Inspection/Check			601	101-200,
Approved/Repairs			801	101-200,
STAGE 1.6 LPC STATOR RUBSTRIP	72-21-08			
Inspection/Check			601	101-200,
LPC STATOR ASSEMBLY	72-22-00			
Description and Operation			1	101-200,
Description			1	101-200,
FAN FRAME ASSEMBLY	72-23-00			
Description and Operation			1	101-200,
Fan Cases			1	101-200,
Fan Case Assembly			1	101-200,
Fan Exit Case and Vane Assembly			1	101-200,
Intermediate Case			1	101-200,
FRONT FAN CASE ASSEMBLY	72-23-01			
Removal/Installation			401	101-200,
Procedures (Configuration 1)			401	101-200,
Procedures (Configuration 2)			404	101-200,
Inspection/Check			601	101-200,
Inspect fan Case Duct Segments (Rubstrips)			601	101-200,
Approved Repairs			801	101-200,
Repair Large Holes In the Duct Segment			801	101-200,
Repair Duct Segment Cracks			802	101-200,
FAN EXIT CASE AND VANE ASSEMBLY	72-23-02			
Inspection/Check			601	101-200,
Approved Repairs			801	101-200,
Repair the Airfoil of a Vane with a Patch (All Areas of the Airfoil, Smaller Damage) - Fan Exit Case and Vane			801	101-200,
Repair the Airfoil of the Vane with a Patch (Leading Edge, Larger Damage) - Fan Exit Case and Vane			804	101-200,
Replace Fan Exit Guide Vanes			807	101-200,

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SUBJECT	CH/SE/SU	C	PAGE	EFFECTIVITY
Vane Removal/Repair			813	101-200,
Replace the Lockwire and Nuts for the Vanes			818	101-200,
Repair Base and Vane Assembly Cracked or Broken Bases			818	101-200,
Smooth Damage - Fan Exit Case and Vane			820	101-200,
Repair the Airfoil of the Vane with a Partial or Full Span Replacement of the Wire Mesh Leading Edge - Fan Exit Case and Vane			823	101-200,
Repair the Airfoil of the Vane with a Metal Shield over the Leading Edge - Fan Exit Case and Vane Assembly			826	101-200,
Repair The Fan Exit Vane Leading Edge With Tape			826	101-200,
Repair the Airfoil of the Vane with a Full Replacement of Metal Leading Edge or Wire Mesh			832	101-200,
FAN EXIT LINER SEGMENTS	72-23-05			
Removal/Installation			401	101-200,
Removal/Installation of Fan Exit Liner Segments (Inner Rear)			401	101-200,
Fan Exit Liner Segments (Inner Front)			417	101-200,
Fan Exit Liner Segments (Outer)			425	101-200,
Inspection/Check			601	101-200,
Examine the Fan Exit Liner Segments (Outer)			601	101-200,
Examine the Fan Exit Liner Segments (Inner Rear)			603	101-200,
Examine the Fan Liner Segments (Inner Front)			609	101-200,
Approved Repairs			801	101-200,
Fan Exit Liner Segments (Inner Rear)			801	101-200,
Fan Exit Liner Segments (Outer)			801	101-200,
FAN EXIT (BIFURCATION) FAIRING	72-23-06			
Removal/Installation			401	101-200,
Inspection/Check			601	101-200,
Examine the Fan Exit (Bifurcation) Fairing			601	101-200,
Approved Repairs			801	101-200,
Install Boltholes in the Replacement Access Covers			801	101-200,
COMPRESSOR INTERMEDIATE CASE	72-23-07			
Inspection/Check			601	101-200,
Examine the Compressor Intermediate Case			601	101-200,
Approved Repairs			801	101-200,

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SUBJECT	CH/SE/SU	C	PAGE	EFFECTIVITY
Blend Repair Surface Damage - Compressor Intermediate Case External Skin			801	101-200,
Replace Fan Exit Case Mid Flange Bracket Assemblies - Compressor Intermediate Case			803	101-200,
Replace Rear Fan Exit Case Bracket Compressor Intermediate Case			807	101-200,
Replace Baffles - Compressor Intermediate Case			810	101-200,
COMPRESSOR INTERMEDIATE CASE FAIRING	72-23-08			
Inspection/Check			601	101-200,
Examine the Compressor Intermediate Case Fairing			601	101-200,
Examine the Compressor Intermediate Case E Flange Bolts			604	101-200,
Approved Repairs			801	101-200,
Replace a Fairing with no Rivets at the Leading Edge			801	101-200,
Replace a Fairing with Rivets all Around			803	101-200,
Replace a Fairing with no Rivets at the Leading Edge			808	101-200,
COMPRESSOR SECTION	72-30-00			
Description and Operation			1	101-200,
Approved Repairs			801	101-200,
Replace Helical Coil Inserts (AP-2 through AP-7) into HPC Front and Rear Case Assembly			801	101-200,
HIGH PRESSURE COMPRESSOR ROTOR	72-31-00			
Description and Operation			1	101-200,
Description			1	101-200,
FIRST STAGE COMPRESSOR STATOR	72-31-02			
Removal/Installation			401	101-200,
Inspection/Check			601	101-200,
Inspect First Stage Compressor Stator Vane			601	101-200,
Fluorescent Penetrant Inspect First Stage Compressor Stator Vanes			604	101-200,
Approved Repairs			801	101-200,
Blend Repair Stage 1 LPC Stator			801	101-200,
COMPRESSOR VARIABLE STATOR ASSEMBLY	72-32-00			
Description and Operation			1	101-200,
Description			1	101-200,
HPC ROTOR BLADES	72-32-02			
Approved Repairs			801	101-200,
5TH STAGE SYNCHRONIZING RING ASSEMBLY	72-32-03			
Approved Repairs			801	101-200,

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SUBJECT	CH/SE/SU	C	PAGE	EFFECTIVITY
COMPRESSOR REAR STATOR ASSEMBLY	72-33-00			
Description and Operation			1	101-200,
COMPRESSOR REAR FRAME ASSEMBLY	72-34-00			
Description and Operation			1	101-200,
Compressor Case			1	101-200,
Diffuser Case			1	101-200,
COMBUSTION SECTION	72-40-00			
Description and Operation			1	101-200,
COMBUSTION LINER ASSEMBLY	72-41-00			
Description and Operation			1	101-200,
Description			1	101-200,
DIFFUSER CASE ASSEMBLY	72-41-01			
Approved Repairs			801	101-200,
TURBINE SECTION	72-50-00			
Description and Operation			1	101-200,
FIRST STAGE HPT NOZZLE ASSEMBLY	72-51-00			
Description and Operation			1	101-200,
TURBINE ROTOR BLADE, STAGE 6	72-52-01			
Inspection/Check			601	101-200,
TURBINE STATOR VANE, STAGE 6	72-52-02			
Inspection/Check			601	101-200,
STAGE 6 LPT (OUTER) AIRSEALING RING SEGMENT ASSEMBLY	72-52-03			
Inspection/Check			601	101-200,
Inspect Stage 6 LPT (Outer) Airsealing Ring Segment Assembly			601	101-200,
LPT BORESCOPE PORT	72-52-04			
Approved Repairs			801	101-200,
Reposition/Reoperate LPT Outer Transition Duct Heatshield			801	101-200,
HIGH PRESSURE TURBINE ROTOR ASSEMBLY	72-53-00			
Description and Operation			1	101-200,
General			1	101-200,
LOW PRESSURE TURBINE STATOR ASSEMBLY	72-56-00			
Description and Operation			1	101-200,
LOW PRESSURE TURBINE ROTOR ASSEMBLY	72-57-00			
Description and Operation			1	101-200,
General			1	101-200,
EXHAUST CASE ASSEMBLY	72-58-00			
Description and Operation			1	101-200,
General			1	101-200,
Turbine Exhaust Case Description			1	101-200,
TURBINE EXHAUST CASE ASSEMBLY	72-58-01			

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SUBJECT	CH/SE/SU	C	PAGE	EFFECTIVITY
Maintenance Practices			201	101-200,
Inspection/Check			601	101-200,
INLET GEARBOX ASSEMBLY	72-61-00			
Description and Operation			1	101-200,
Description			1	101-200,
TOWER SHAFT	72-62-00			
Description and Operation			1	101-200,
Description			1	101-200,
ANGLE GEARBOX ASSEMBLY	72-63-00			
Description and Operation			1	101-200,
Description			1	101-200,
Removal/Installation			401	101-200,
Inspection/Check			601	101-200,
Examine the Angle Gearbox for Cracks, Oil Leaks, and Corrosion			601	101-200,
Examine the Angle Gearbox for Support Pin Migration			601	101-200,
HORIZONTAL DRIVE SHAFT ASSEMBLY	72-64-00			
Description and Operation			1	101-200,
Description			1	101-200,
ACCESSORY GEARBOX ASSEMBLY	72-65-00			
Description and Operation			1	101-200,
General Description			1	101-200,
Accessory Drives			1	101-200,
MAIN GEARBOX	72-65-01			
Inspection/Check			601	101-200,
Inspect Main Gearbox for Oil Leakage, Cracks, and Corrosion			601	101-200,
Cleaning/Painting			701	101-200,
Main Gearbox Shaft Seal Face Cleaning			701	101-200,
DEOILER DRIVE OIL SEAL ASSEMBLY	72-65-02			
Removal/Installation			401	101-200,
STARTER DRIVE OIL SEAL ASSEMBLY	72-65-03			
Removal/Installation			401	101-200,
INTEGRATED DRIVE GENERATOR (IDG) DRIVE OIL SEAL ASSEMBLY	72-65-04			
Removal/Installation			401	101-200,
FADEC ALTERNATOR DRIVE OIL SEAL ASSEMBLY	72-65-05			
Removal/Installation			401	101-200,
FUEL PUMP DRIVE OIL SEAL ASSEMBLY	72-65-06			
Removal/Installation			401	101-200,
HYDRAULIC PUMP REAR DRIVE OIL SEAL ASSEMBLY	72-65-07			
Removal/Installation			401	101-200,
HYDRAULIC PUMP FRONT DRIVE OIL SEAL ASSEMBLY	72-65-08			

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SUBJECT	CH/SE/SU	C	PAGE	EFFECTIVITY
Removal/Installation			401	101-200,
STARTER DRIVE COUPLING	72-65-09			
Removal/Installation			401	101-200,
MAIN OIL FILTER HOUSING	72-65-11			
Removal/Installation			401	101-200,
FADEC ALTERNATOR DRIVE GEARSHAFT AND BEARINGS ASSEMBLY	72-65-15			
Removal/Installation			401	101-200,

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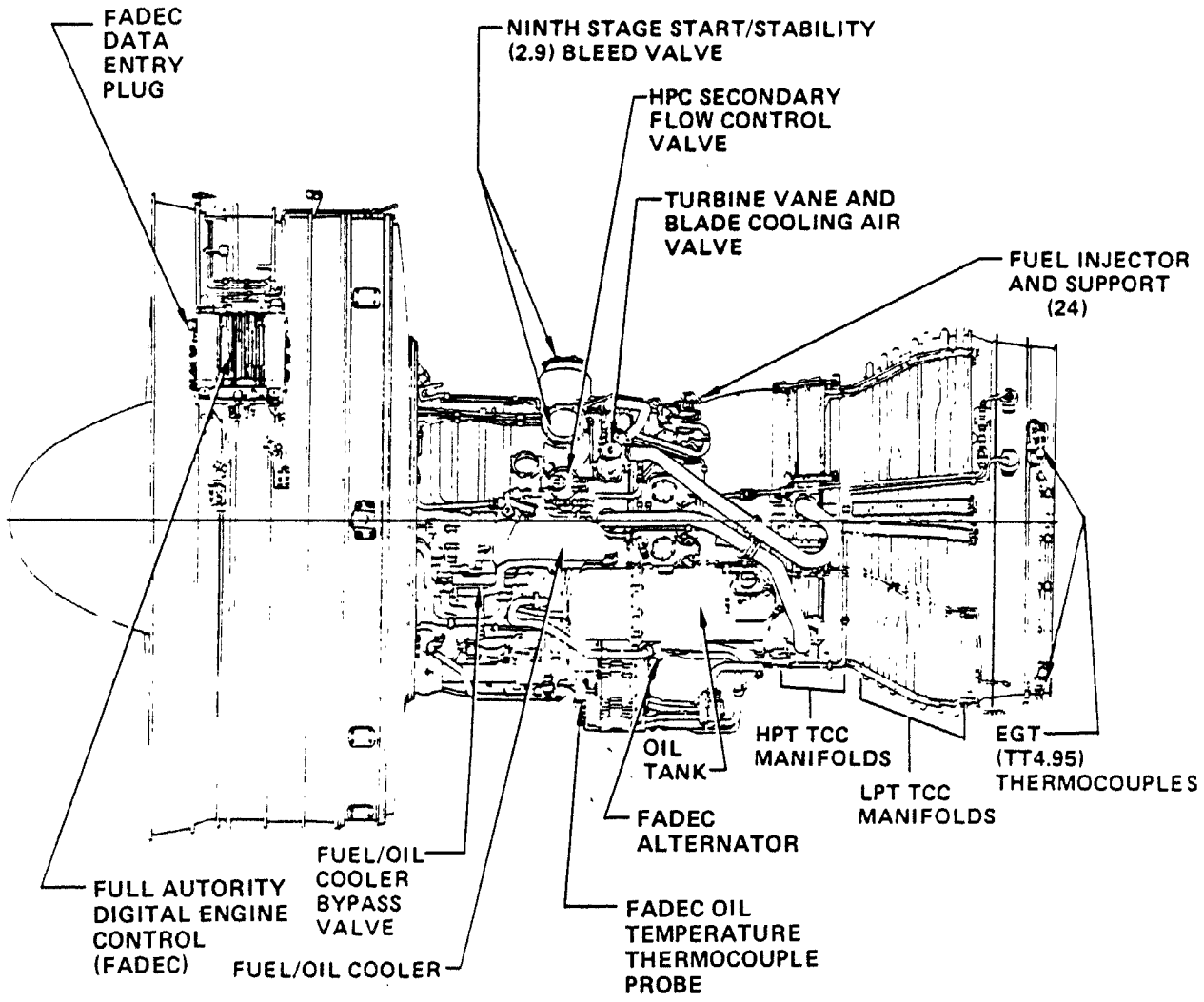
1. Description (Ref. Fig. 001, 002, 003)
(Ref. Fig. 004, 005)

A. The engine without airframe installations is approximately 133 in. (3378 mm) long and 97 in. (2464 mm) across the largest diameter.

B. The engine is a two-spool axial flow turbofan engine of high compression and bypass ratio, having 16 compressor stages, an annular combustion chamber, and 6 turbine stages. The low pressure system consists of a five-stage Low Pressure Compressor (LPC) and a four-stage Low Pressure Turbine (LPT) and is mechanically independent of the high pressure system consisting of the 11 stage High Pressure Compressor (HPC) and two-stage High Pressure Turbine (HPT).

C. The 1st stage of the Low Pressure Compressor (LPC) rotor, referred to as the "fan", is larger in diameter than the other Compressor stages, and produces two separate airstreams. The primary (inner) airstream passes through the engine gaspath, where it is compressed and employed in the generation of heated gases which provide propulsive force. The secondary (outer) airstream is compressed by the fan and ducted outside the engine, adding to the propulsive force. The engine cases, when bolted together, form a structurally rigid support for the engine, with internal parts supported through struts and bearings. The engine mounts are located at the 12 o'clock positions on the intermediate case and turbine exhaust case.

D. Compressor Section (Ref. Fig. 006)
(1)Low Pressure Compressor (LPC)
(a)The LPC is a five stage rotor and stator assembly. This assembly provides the initial compression of the ambient (inlet) air which is then ducted through the intermediate case to the high pressure compressor (HPC). The compressor inlet cone mounted on the front compressor hub provides a smooth aerodynamic fairing at the inlet of the LPC.
(b)The LPC rotor is driven by low pressure turbine (LPT). Structural support for the rotor is provided by the No. 1 ball bearing which is mounted on the front compressor hub. The 1st stage of the rotor is commonly referred to as the fan stage. Fan blades are replaceable in balanced pairs on installed engines.
(c)The LPC (Stage 1.6, 2 and 3) compressor stator assembly is structurally supported by the fan exit inner case assembly. The 1st stage (LPC Stage 1 compressor stator assembly) of the stator assembly, attached to the forward flange of the LPC stator assembly, is located immediately aft of the fan blades at the entrance to the primary gaspath. Surrounding the front half of the stator assembly is a fan exit fairing which acts as an aerodynamic splitter separating the primary (main gas generator) airstream from the secondary (fan discharge) airstream.
(2)LPC/LPT Coupling (Section) (Ref. Fig. 007)
(a)The LPC/LPT coupling (section) consists of those interface parts that attach and secure the LPC rotor to the low pressure turbine (LPT)


FADEC DATA ENTRY PLUG
NINTH STAGE START/STABILITY (2.9) BLEED VALVE
HPC SECONDARY FLOW CONTROL VALVE
TURBINE VANE AND BLADE COOLING AIR VALVE
FUEL INJECTOR AND SUPPORT (24)
OIL TANK
HPT TCC MANIFOLDS
LPT TCC MANIFOLDS
EGT (TT4.95) THERMOCOUPLES
FADEC ALTERNATOR
FUEL/OIL COOLER BYPASS VALVE
FULL AUTORITY DIGITAL ENGINE CONTROL (FADEC)
FUEL/OIL COOLER
FADEC OIL TEMPERATURE THERMOCOUPLE PROBE

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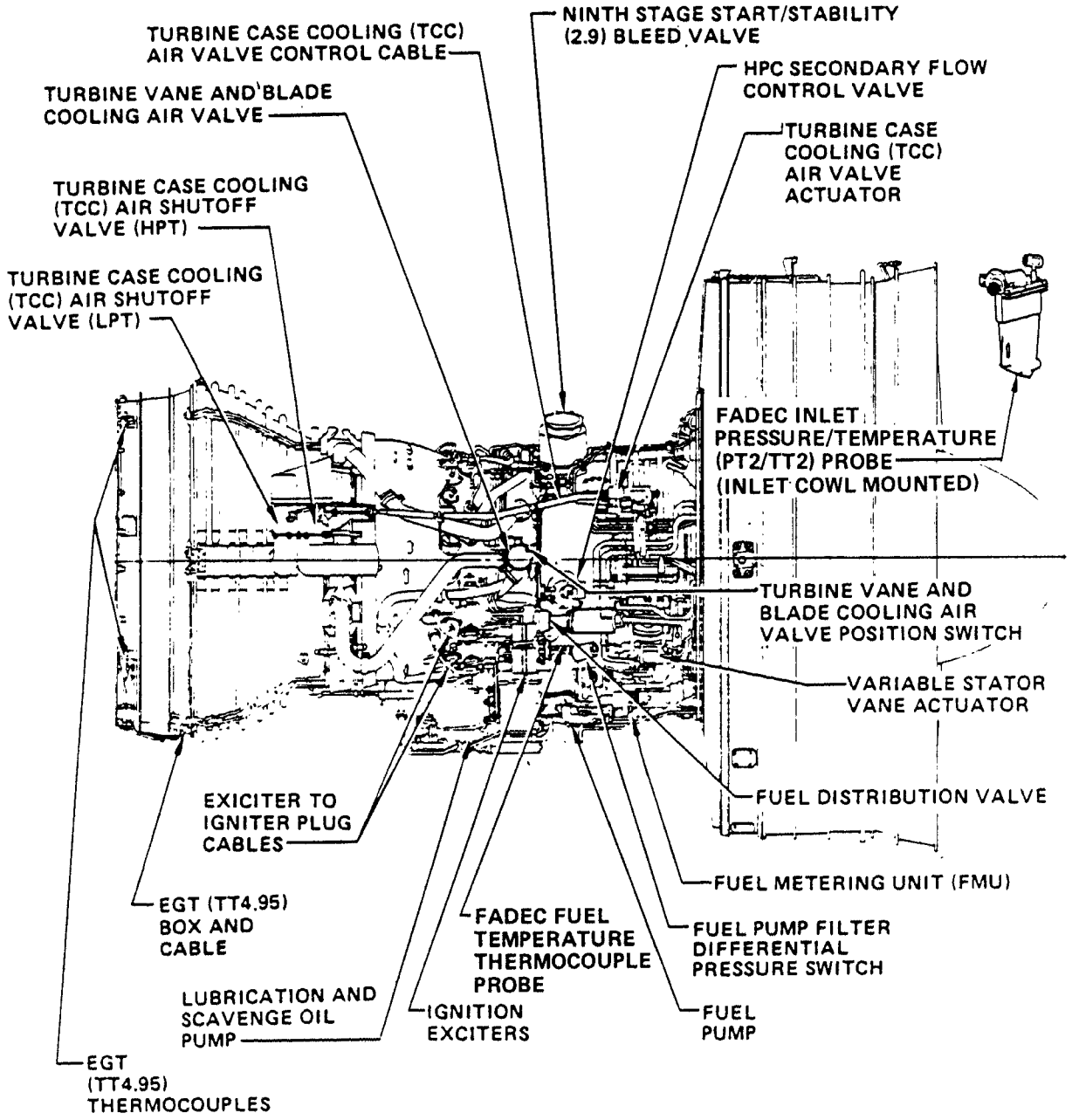
Engine External Components (Left Side)
Figure 001


TURBINE CASE COOLING (TCC) AIR VALVE CONTROL CABLE
NINTH STAGE START/STABILITY (2.9) BLEED VALVE
HPC SECONDARY FLOW CONTROL VALVE
TURBINE VANE AND BLADE COOLING AIR VALVE
TURBINE CASE COOLING (TCC) AIR VALVE ACTUATOR
TURBINE CASE COOLING (TCC) AIR SHUTOFF VALVE (HPT)
TURBINE CASE COOLING (TCC) AIR SHUTOFF VALVE (LPT)
FADEC INLET PRESSURE/TEMPERATURE (PT2/TT2) PROBE (INLET COWL MOUNTED)
TURBINE VANE AND BLADE COOLING AIR VALVE POSITION SWITCH
VARIABLE STATOR VANE ACTUATOR
FUEL DISTRIBUTION VALVE
EXICITER TO IGNITER PLUG CABLES
FUEL METERING UNIT (FMU)
EGT (TT4.95) BOX AND CABLE
FADEC FUEL TEMPERATURE THERMOCOUPLE PROBE
FUEL PUMP FILTER DIFFERENTIAL PRESSURE SWITCH
LUBRICATION AND SCAVENGE OIL PUMP
IGNITION EXCITERS
FUEL PUMP
EGT (TT4.95) THERMOCOUPLES

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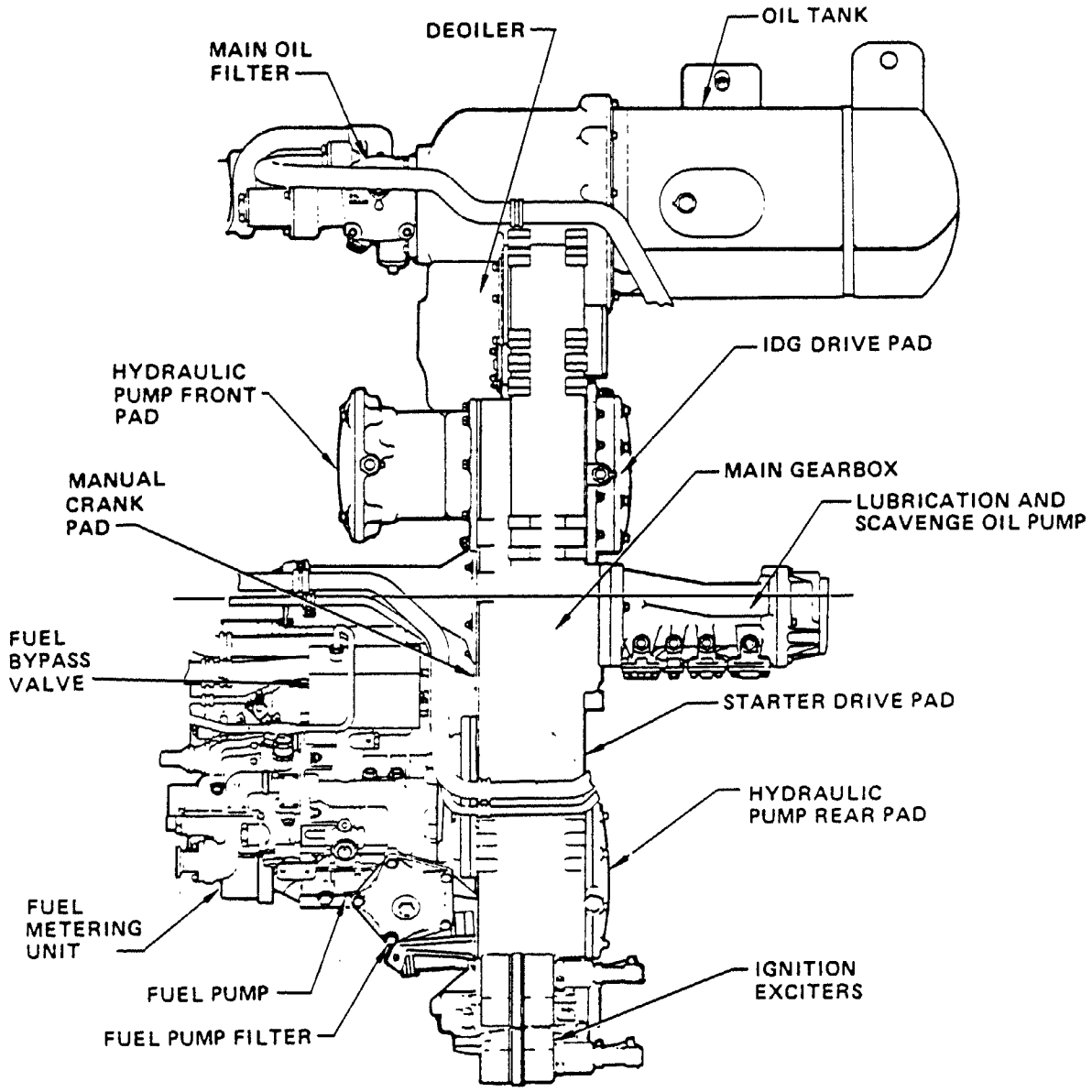
Engine External Components (Right Side)
Figure 002



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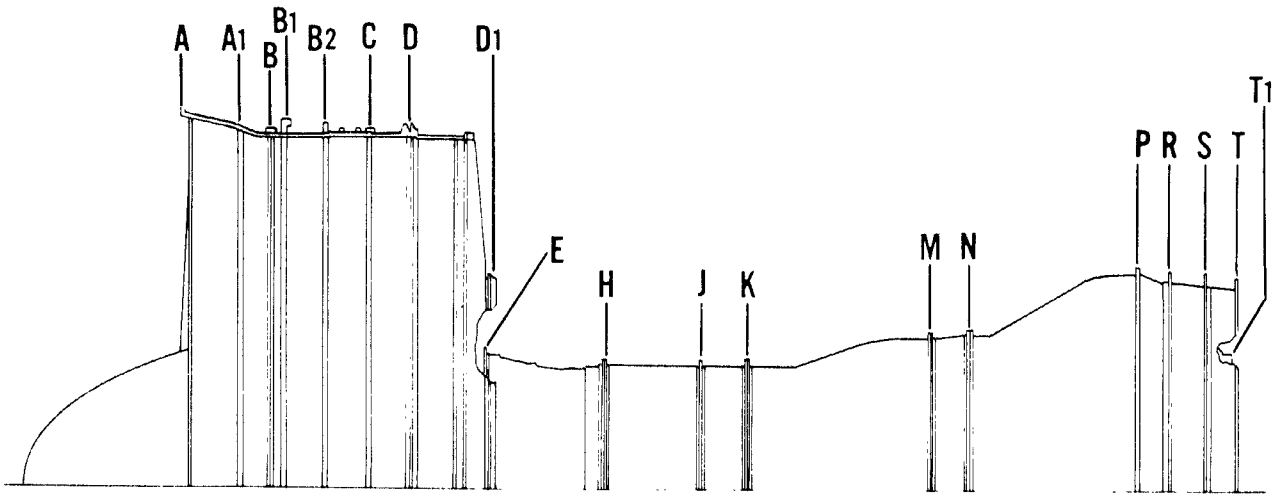
Engine External Components (Bottom View)
Figure 003



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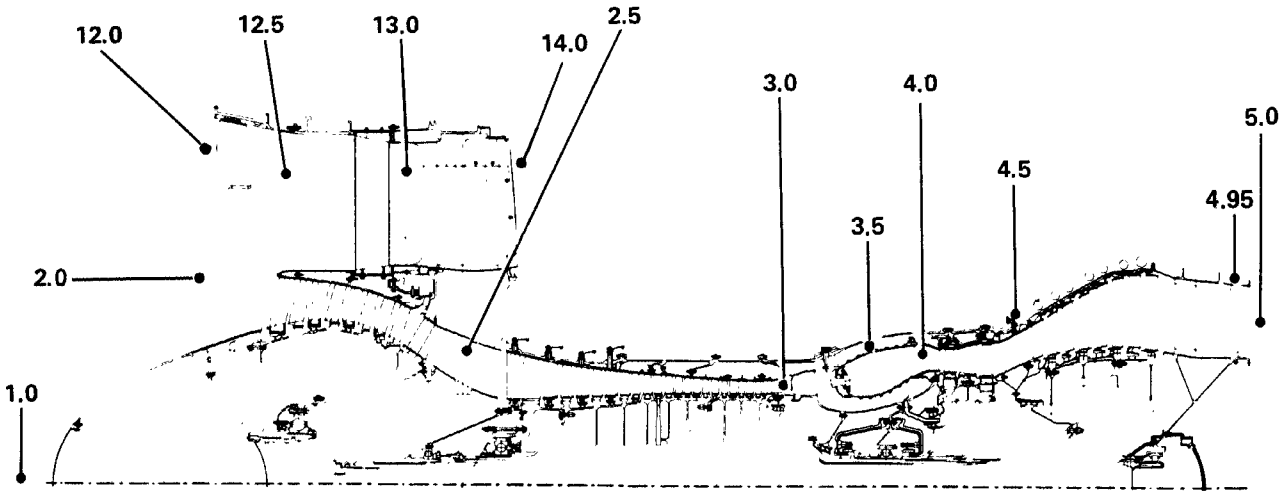
Engine Flange Identification
Figure 004



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STATION	DESCRIPTION
1.0	AMBIENT
2.0	FAN INLET ID
2.5	LOW COMPRESSOR EXIT
3.0	DIFFUSER INLET - UPSTREAM OF THE DIFFUSER BLEED PORTS AND DIVERGENT NOZZLE
3.5	COMBUSTOR
4.0	COMBUSTOR EXIT
4.5	HPT EXIT, LPT INLET TRANSITION DUCT
4.95	TURBINE EXHAUST CASE, TEMPERATURE AND PRESSURE MEASURING PROBE LOCATION.
5.0	TURBINE EXIT GUIDE VANE EXIT
12.0	FAN INLET OD
12.5	FAN EXIT - ROTOR TRAILING EDGE
13.0	FAN EXIT - UPSTREAM OF FAN EXIT GUIDE VANE
14.0	FAN EXIT GUIDE VANE, EXIT

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Designation of Engine Stations
Figure 005

shaft. The main feature of this section is a turbine shaft coupling which is splined to both the front compressor hub and the LPT shaft. This coupling is supported structurally through the No. 1.5 roller bearing to the intermediate case. Mounted on the coupling is a motional pickup wheel from which the low rotor speed (N1) is determined.

(3)Fan Case (Ref. Fig. 008)

(a)Between the nose cowl and the airframe supplied fan exhaust hardware are separate fan cases whose purpose is to contain the fan discharge airstream and to provide the structural link between the airframe and the core engine. The fan case assembly supports the inlet cowl and provides for containment of the fan blades. The fan exit case and vane assembly straightens the fan discharge airstream prior to the air entering the airframe supplied fan exhaust hardware.

(b)The 2.5 bleed valve assembly attached to the fan exit inner case assembly at the LPC exit ensures stable operation at low power levels and increases stall margin during starting and when required at other operating conditions.

(4)Intermediate Case (Ref. Fig. 009, 010)

(a)The intermediate case is a major structural member of the engine that supports the thrust bearings for the LPC and HPC rotors. Two mount brackets located on the rear of the compressor intermediate case transmit the thrust generated by both rotors directly to the airframe structure. A puck arrangement on the upper rear face of the compressor intermediate case provides for an airframe structure connection to carry engine vertical and side loads.

(5)High Pressure Compressor (HPC) (Ref. Fig. 011)

(a)The HPC consists of an inlet guide vane (IGV) stator assembly and an eleven stage rotor and stator assembly. The purpose of the HPC is to further compress air delivered by the LPC and to direct this highly compressed air to the diffuser and combustor area. Customer bleed connections are provided at the 8th stage to satisfy aircraft pneumatic requirements.

(b)The HPC rotor is driven by the high pressure turbine (HPT). The HPC rotor is supported at the front by the no. 2 ball bearing and at the rear by the No. 3 roller bearing.

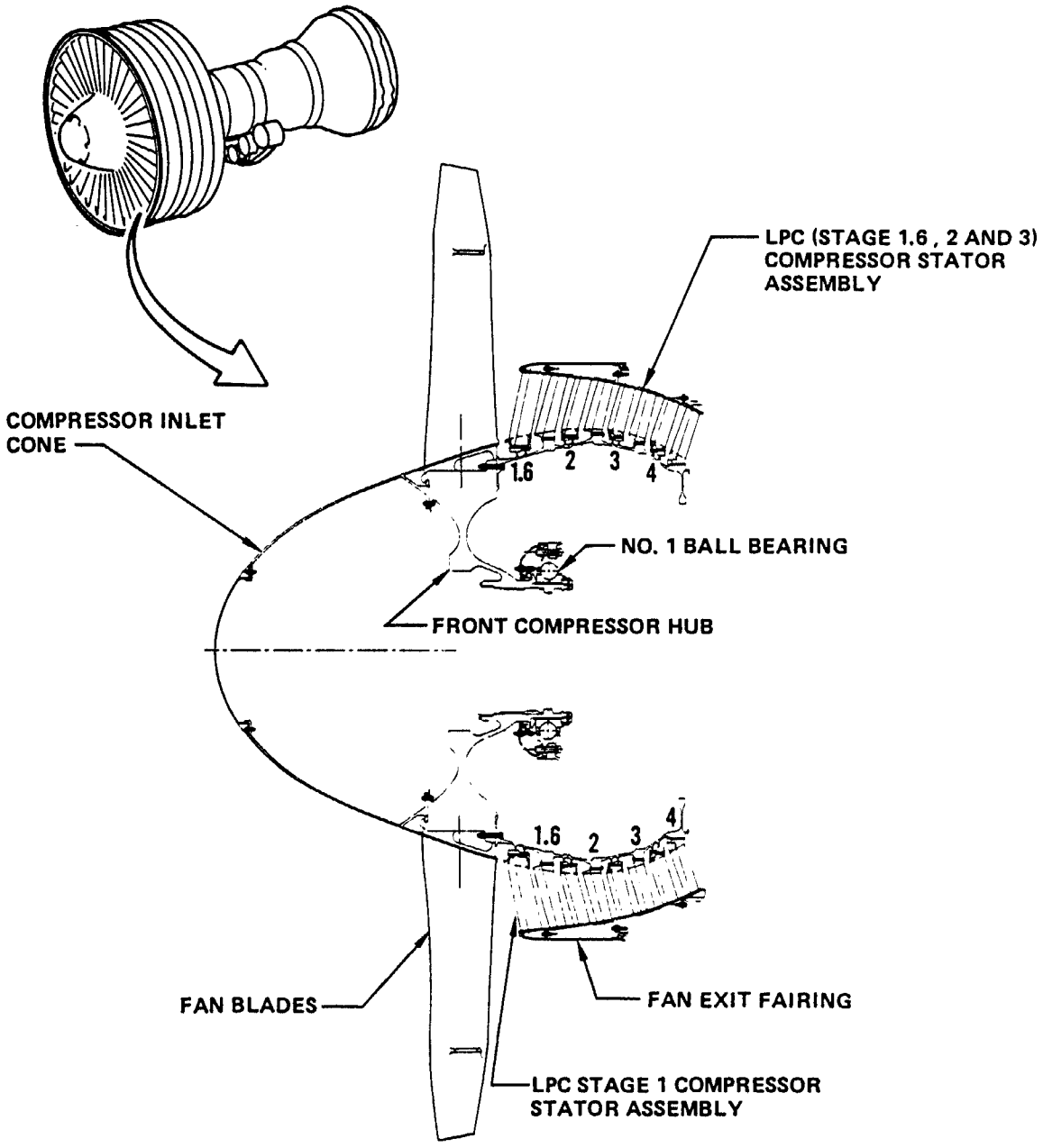
(c)The HPC static structure consists of both variable stator vane stages and fixed stator vane stages.

Each of the four variable stator vane stages is attached to a synchronizing ring assembly. The four synchronizing ring assemblies are linked to a stator vane actuator controlled by the FADEC which automatically adjusts the variable stator vanes to provide adequate stall margin for engine starting, acceleration and part power operation.

E. Combustion Section

(1)Diffuser and Combustor (Ref. Fig. 012, 013)

(a)The diffuser and combustor is attached to the high pressure compressor (HPC) rear case. The compressed air flows from the exit of the HPT into the diffuser and combustor section. The airflow is straightened and diffused (allowed to expand) which reduces the velocity and raises the pressure of the airflow prior to entering the combustion chamber. Metered fuel is provided to the combustion chamber through twenty four (24)



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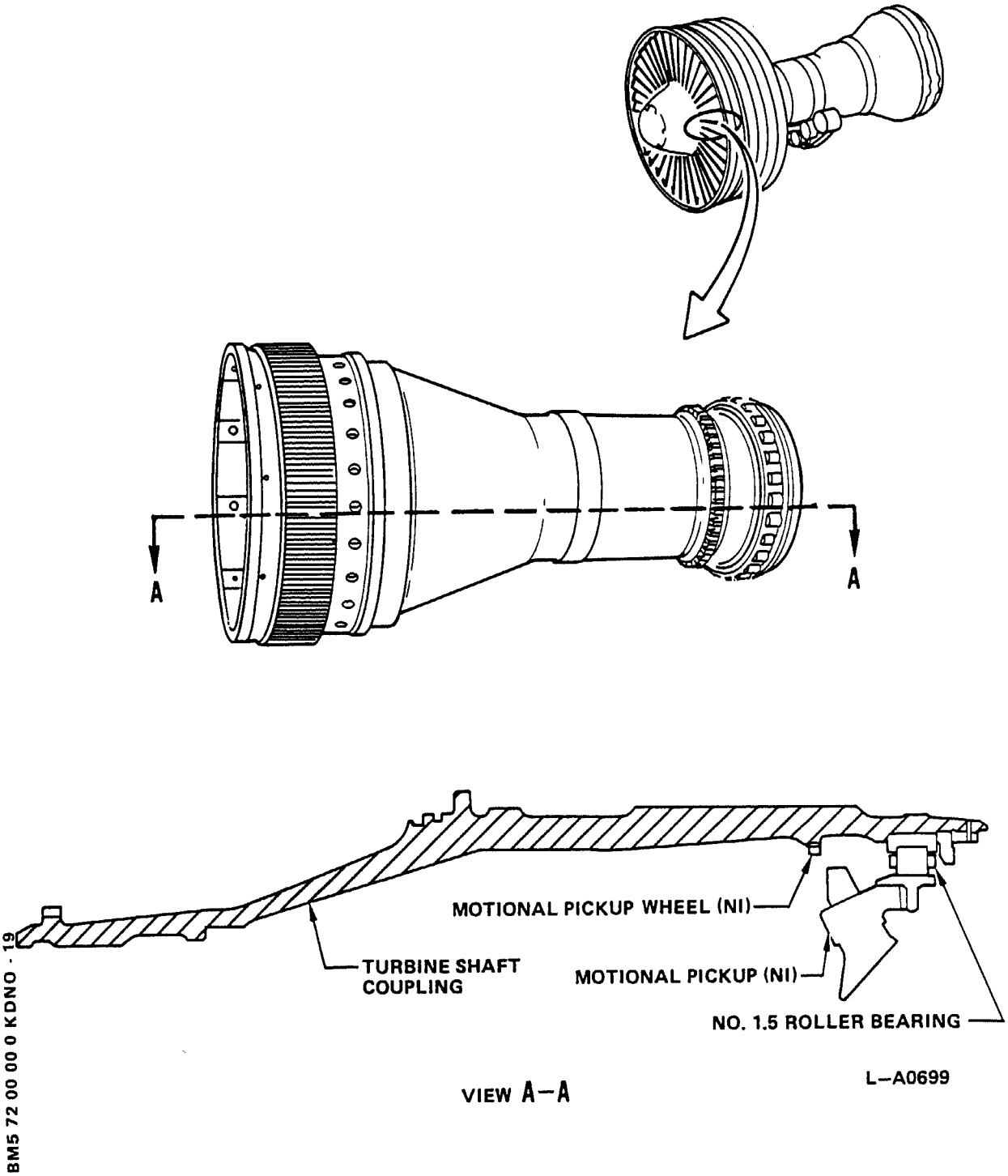
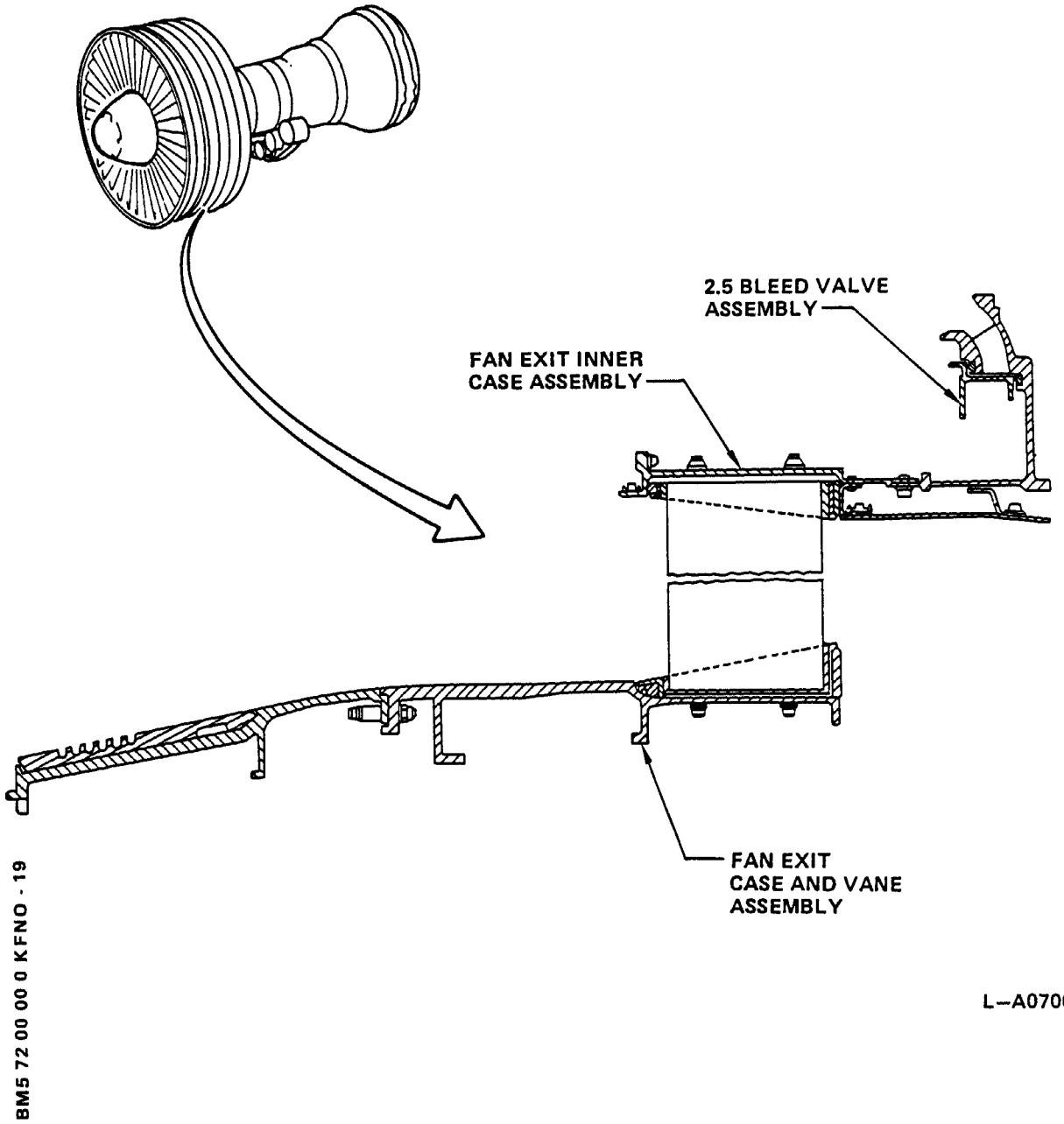
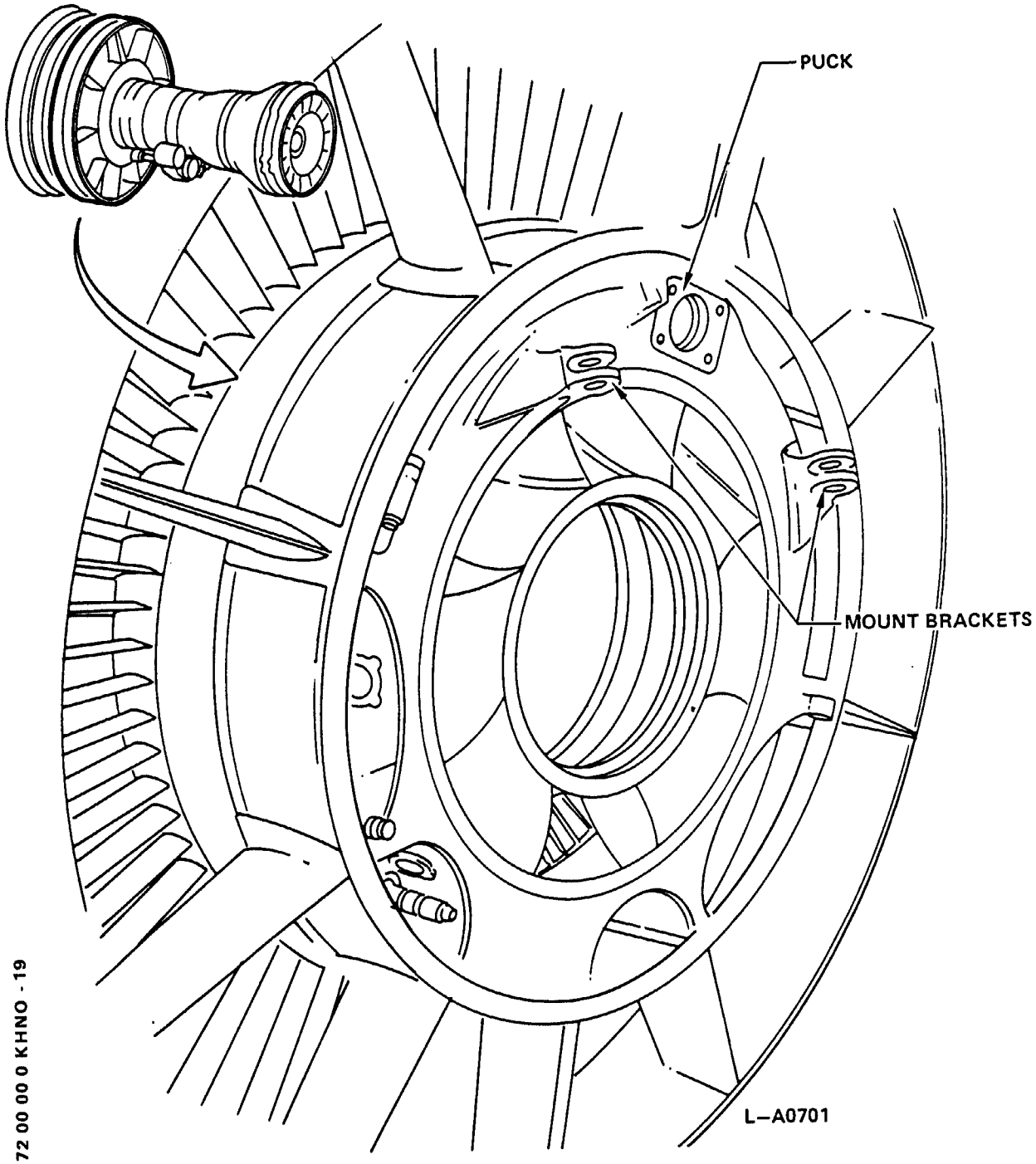
Low Pressure Compressor (LPC)
Figure 006



LPC/LPT Coupling
Figure 007



Fan Cases
Figure 008



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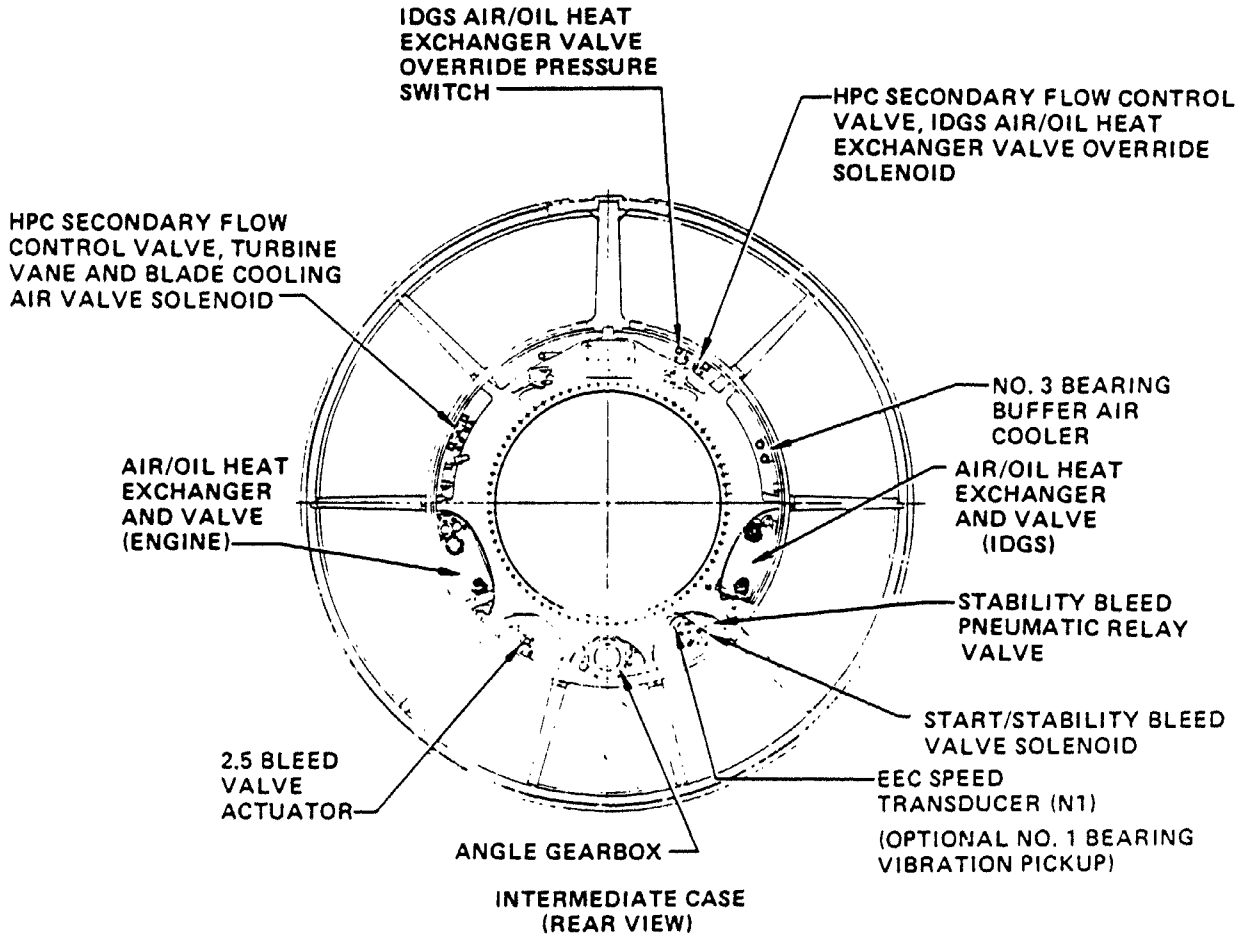
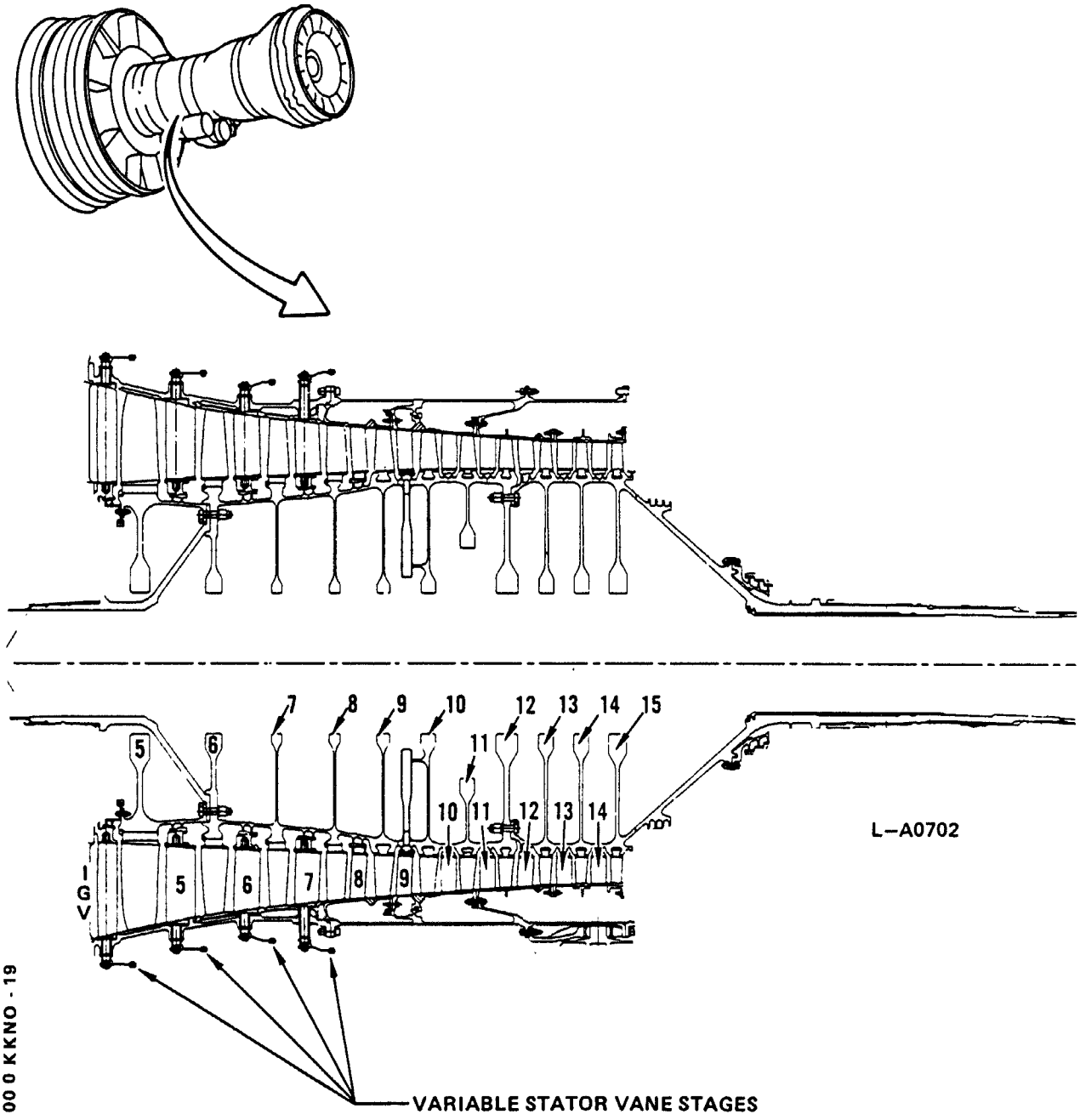
Intermediate Case
Figure 009


IDGS AIR/OIL HEAT EXCHANGER VALVE OVERRIDE PRESSURE SWITCH
HPC SECONDARY FLOW CONTROL VALVE, IDGS AIR/OIL HEAT EXCHANGER VALVE OVERRIDE SOLENOID
HPC SECONDARY FLOW CONTROL VALVE, TURBINE VANE AND BLADE COOLING AIR VALVE SOLENOID
NO. 3 BEARING BUFFER AIR COOLER
AIR/OIL HEAT EXCHANGER AND VALVE (IDGS)
AIR/OIL HEAT EXCHANGER AND VALVE (ENGINE)
STABILITY BLEED PNEUMATIC RELAY VALVE
START/STABILITY BLEED VALVE SOLENOID
2.5 BLEED VALVE ACTUATOR
EEC SPEED TRANSDUCER (N1)
(OPTIONAL NO. 1 BEARING VIBRATION PICKUP)
ANGLE GEARBOX
INTERMEDIATE CASE (REAR VIEW)

BM5 72 00 00 0 KEMO - 24 - 19
DM5

L-A1184
0187

Intermediate Case
Figure 010



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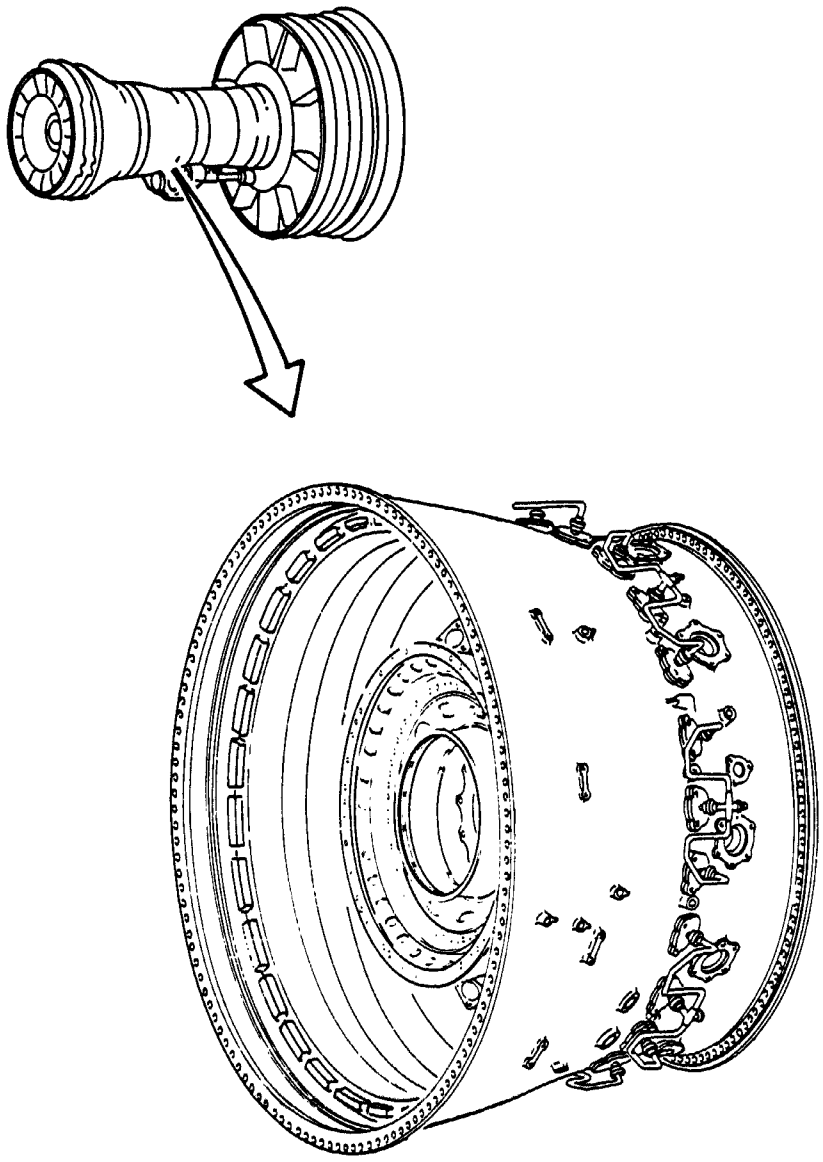
High Pressure Compressor
Figure 011

fuel injectors. The fuel and air mixture is burned within the combustion chamber. The heat resulting from the combustion process causes the airflow to expand and accelerate rearward to drive the turbines and produce thrust at the exhaust (jet) nozzle.

F. Turbine Section
(1)General
(a)The turbine section contains the turbine nozzle, the high pressure turbine (HPT), the low pressure turbine (LPT), and the turbine exhaust case.
(2)Turbine Nozzle (Ref. Fig. 014, 015)
(a)The turbine nozzle contains the inner combustion chamber, the 1st stage HPT (blade) cooling air duct and the 1st stage HPT (nozzle guide) vane cluster assemblies. The turbine nozzle is located at the rear internal portion of the diffuser case.
(b)The inner combustion chamber (liner) assembly forms the inner half of the annular combustion chamber (burner). The combustion chamber design is commonly referred to as a double pass type burner. The cooling air which is used to insulate the liner from the heat of combustion enters the liner through several small holes at each liner ring into a circumferential groove. This air is then introducted to the inner surface of each liner segment as a uniform cooling film.
(c)The turbine nozzle is formed by 17 vane clusters secured to the 1st stage HPT (blade) cooling air duct and inner combustion chamber. The vanes are air cooled. Cooling air enters the internal passages of each vane. Air exits the vane through a specific pattern of holes to provide a protective film over the gaspath surfaces of the vane. The nozzles formed by the ring of vanes increase the velocity of the hot gasses exiting the combustion chamber and direct these gasses to provide the optimum angle, pressure and flow to the 1st stage turbine blades.
(d)The 1st stage HPT cooling duct assembly, directs cooling air from the inner combustion chamber area of the diffuser case, through a metering nozzle and directs or impinges the air on the turbine rotor for cooling the 1st turbine blades. The cooling duct case contour also forms the rear inner portion of the combustion chamber. Honeycomb seal lands are provided at the interfaces with the 1st stage rotor to reduce leakage of the 1st blade cooling air.
(3)High Pressure Turbine (HPT) (Ref. Fig. 016)
(a)The high pressure turbine (HPT) provides the driving force for the high pressure compressor (HPC). The high pressure turbine is located at the rear of the diffuser and combustor and forward of the low pressure turbine (LPT). The high pressure turbine consists of two turbine rotor stages, case and vane assembly and a rotating inner airseal. The turbine rotor assemblies, 2nd stage vanes and inner airseal are air cooled. The turbine case assembly is also air cooled as part of the automatic turbine rotor clearance control system feature.
(b)The 1st stage turbine rotor employs single crystal material blades, which are cooled by air from the diffuser. The cooling air duct nozzles in the turbine nozzle meters cooling air to the blades. The blades are internally air cooled and externally film cooled.
(c)The 2nd stage turbine rotor assembly employs directionally solidified



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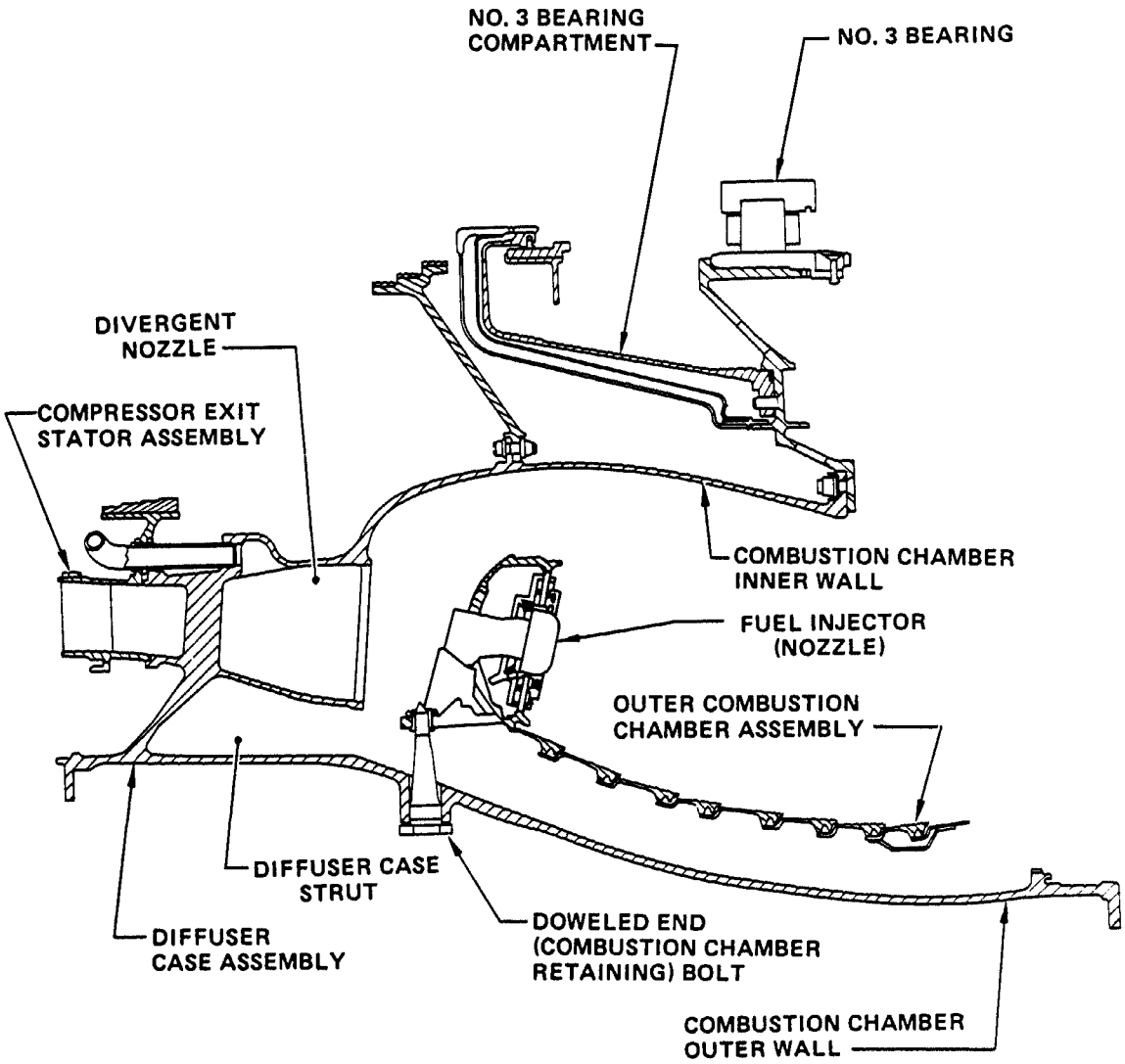
Diffuser and Combustor
Figure 012



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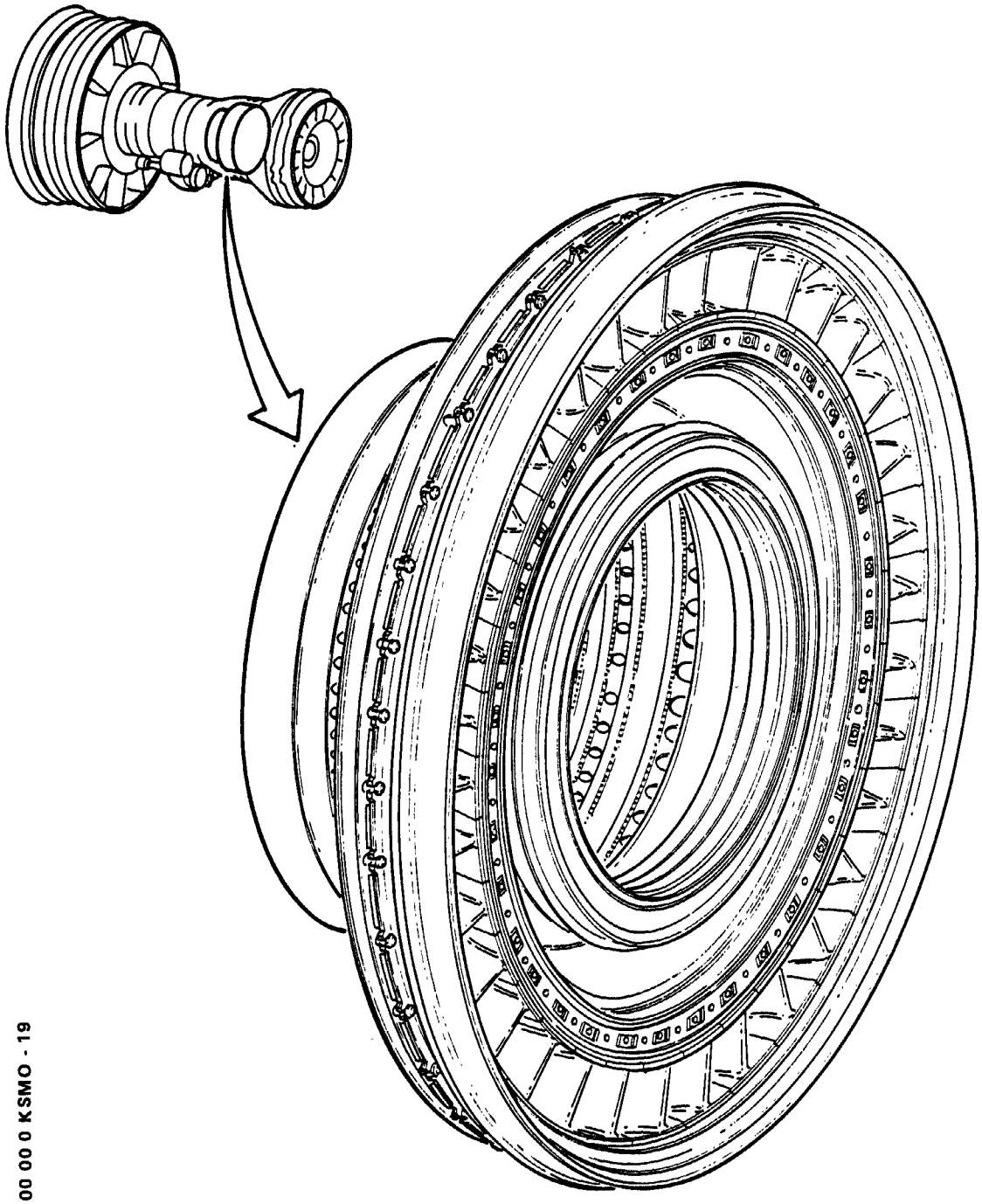
Diffuser and Combustor
Figure 013



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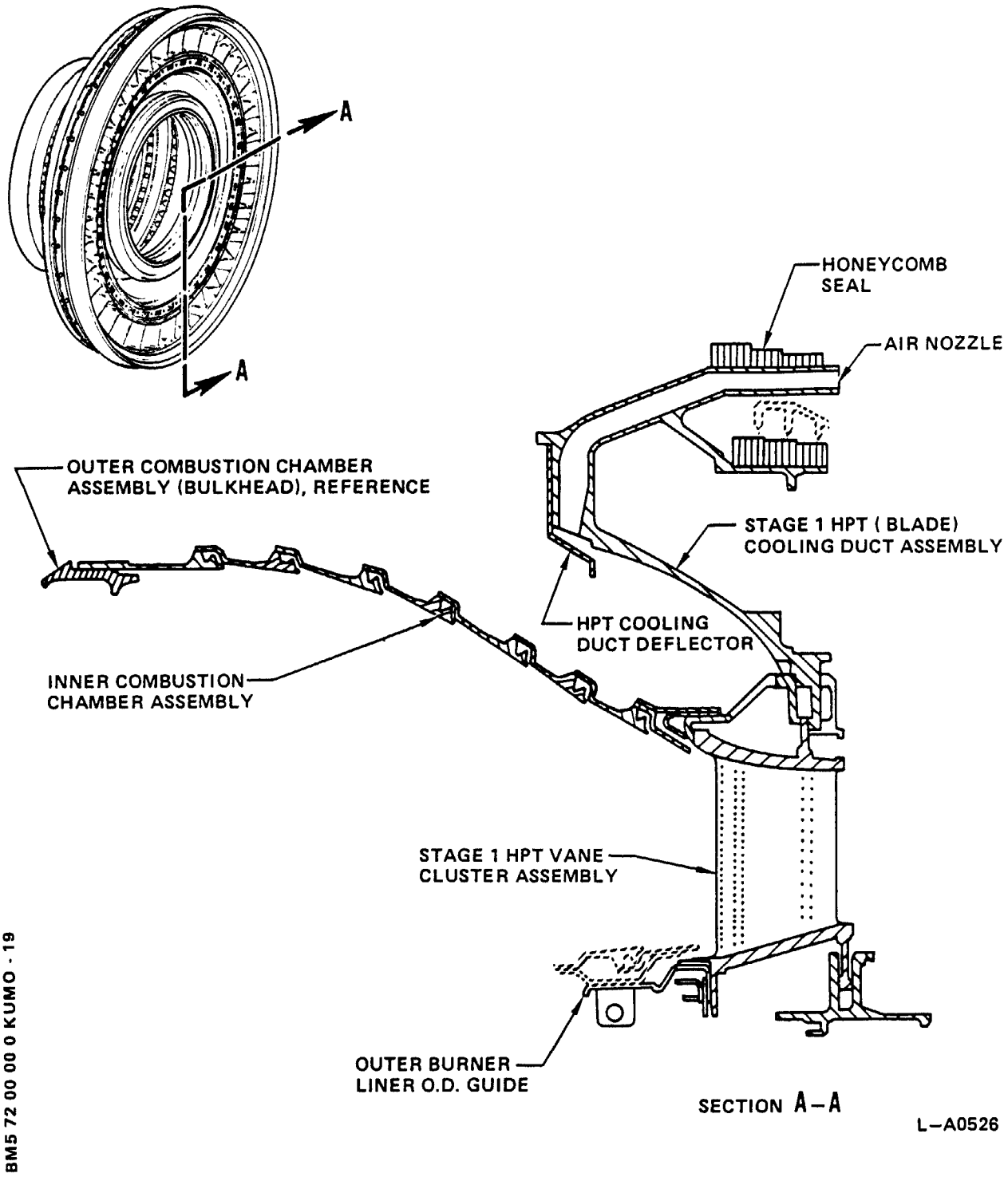
Turbine Nozzle
Figure 014



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Turbine Nozzle
Figure 015

blades which are internally cooled by modulated 12th stage compressor air and diffuser air. Cooling air is reduced at cruise for increased performance.

(d) The 2nd stage vanes are internally air cooled with modulated compressor air. Cooling air is supplied through four external tubes from the 12th stage compressor bleed location. Two of these tubes contain valves which are closed to reduce cooling air flow at cruise conditions to improve performance. An inner air seal land is located on the ID of the 2nd stage vane clusters and is part of the 2nd stage vane inner seal. This seal is cooled by nozzles, mounted on the ID of the vanes.

(e) Automatic turbine rotor clearance control system tubes are mounted to brackets on the outside of the turbine case. These tubes supply fan discharge air to cool the surface of the turbine case during cruise operation. The case cooling results in shrinkage of the turbine case and outer airseal duct segments which decreases the blade tip clearances. The resulting reduced tip clearance provides improved turbine efficiency.

(4) Low Pressure Turbine (LPT) (Ref. Fig. 017, 018, 019)

(a) The low pressure turbine provides the rotational driving force for the low pressure compressor.
This rotational force is transmitted through a shaft at the center of the engine and coupled to the low pressure compressor. The operating speeds, pressures and temperatures are lower than that of the high pressure turbine as the combustion gasses expand and energy is extracted.

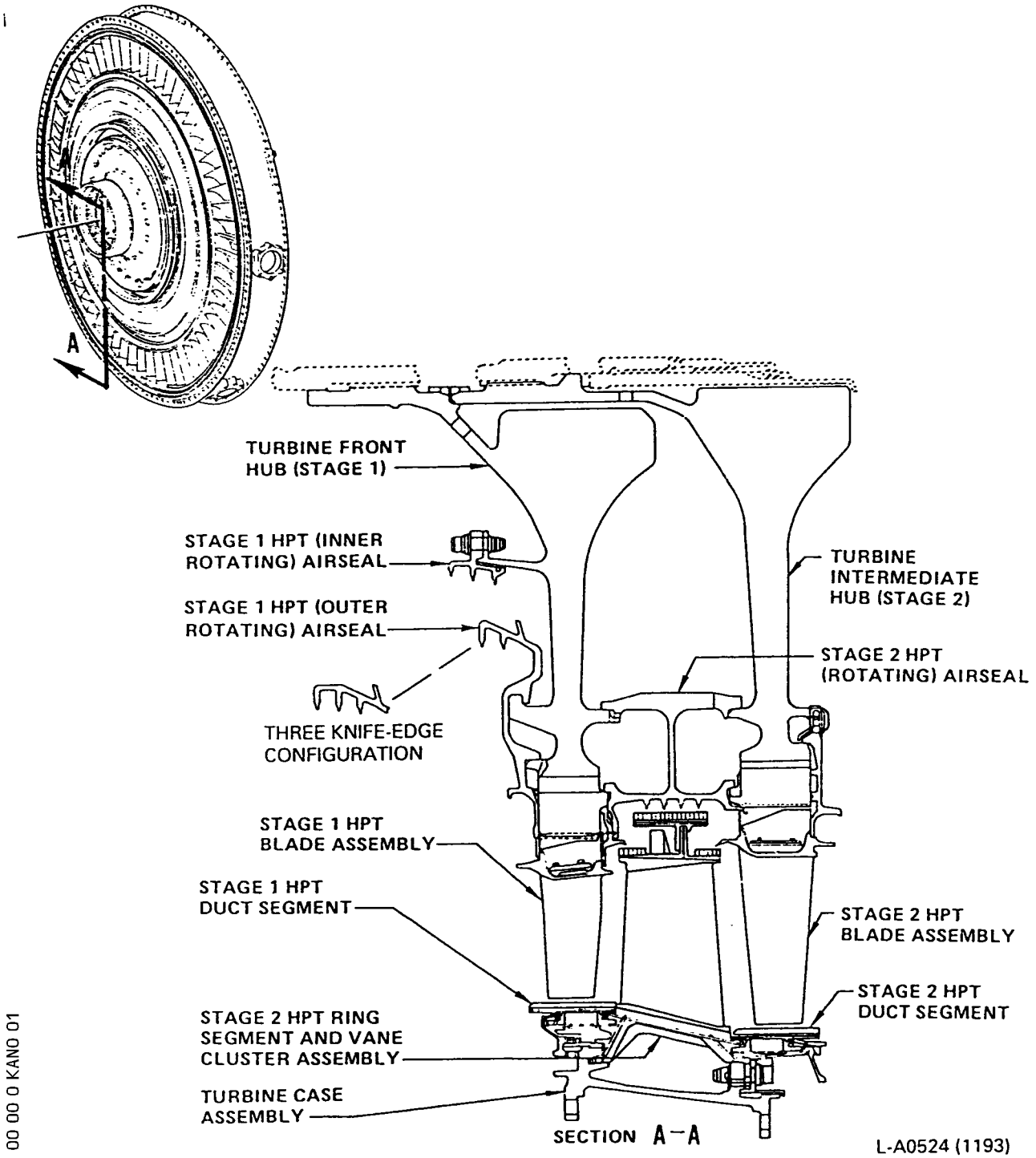
(b) The low pressure turbine is a four stage turbine mounted onto the rear of the high pressure turbine and is located forward of the turbine exhaust case. The 3rd and 4th stage turbine rotors are each cantilevered and attached to the forward side of the 5th stage rear turbine hub. The 6th stage turbine rotor is also attached to the 5th stage rear hub and is cantilevered to the rearward side. Knife-edge seals are positioned between each of the rotating stages, near the ID to seal the stator vanes from gaspath leakage around the vanes.

(c) The low pressure turbine case is designed to permit installation of stator vane clusters, at each stage, directly to the case at OD buttresses. The ID of the vanes clusters in each stage incorporate a honeycomb seal segment which forms a seal land ring. This seal land ring is the static member of the inner vane seal.

(d) Cooling air is provided to the low pressure turbine to reduce and regulate temperatures in the transition duct OD area, the ID of the rotors, inner cavity areas and the stator seal areas. High pressure compressor air is used to cool the 3rd through 5th stage inner and outer areas and 4th stage low pressure compressor air is used to cool the 6th stage inner cavity.

(e) An automatic turbine rotor clearance control system is incorporated to increase the low pressure turbine efficiency at cruise conditions. This system bleeds fan air onto the external surfaces of the low pressure turbine case through tubes mounted close to the case, thus shrinking the case and decreasing the turbine blade tip clearances.

(f) Low pressure turbine vanes are constructed of nickel alloy and are assembled as cast clusters of three vanes. The 3rd stage stator incor-


A
A
TURBINE FRONT HUB (STAGE 1)
STAGE 1 HPT (INNER ROTATING) AIRSEAL
STAGE 1 HPT (OUTER ROTATING) AIRSEAL
THREE KNIFE-EDGE CONFIGURATION
STAGE 1 HPT BLADE ASSEMBLY
STAGE 1 HPT DUCT SEGMENT
STAGE 2 HPT RING SEGMENT AND VANE CLUSTER ASSEMBLY
TURBINE CASE ASSEMBLY
TURBINE INTERMEDIATE HUB (STAGE 2)
STAGE 2 HPT (ROTATING) AIRSEAL
STAGE 2 HPT BLADE ASSEMBLY
STAGE 2 HPT DUCT SEGMENT
SECTION A-A
L-A0524 (1193)

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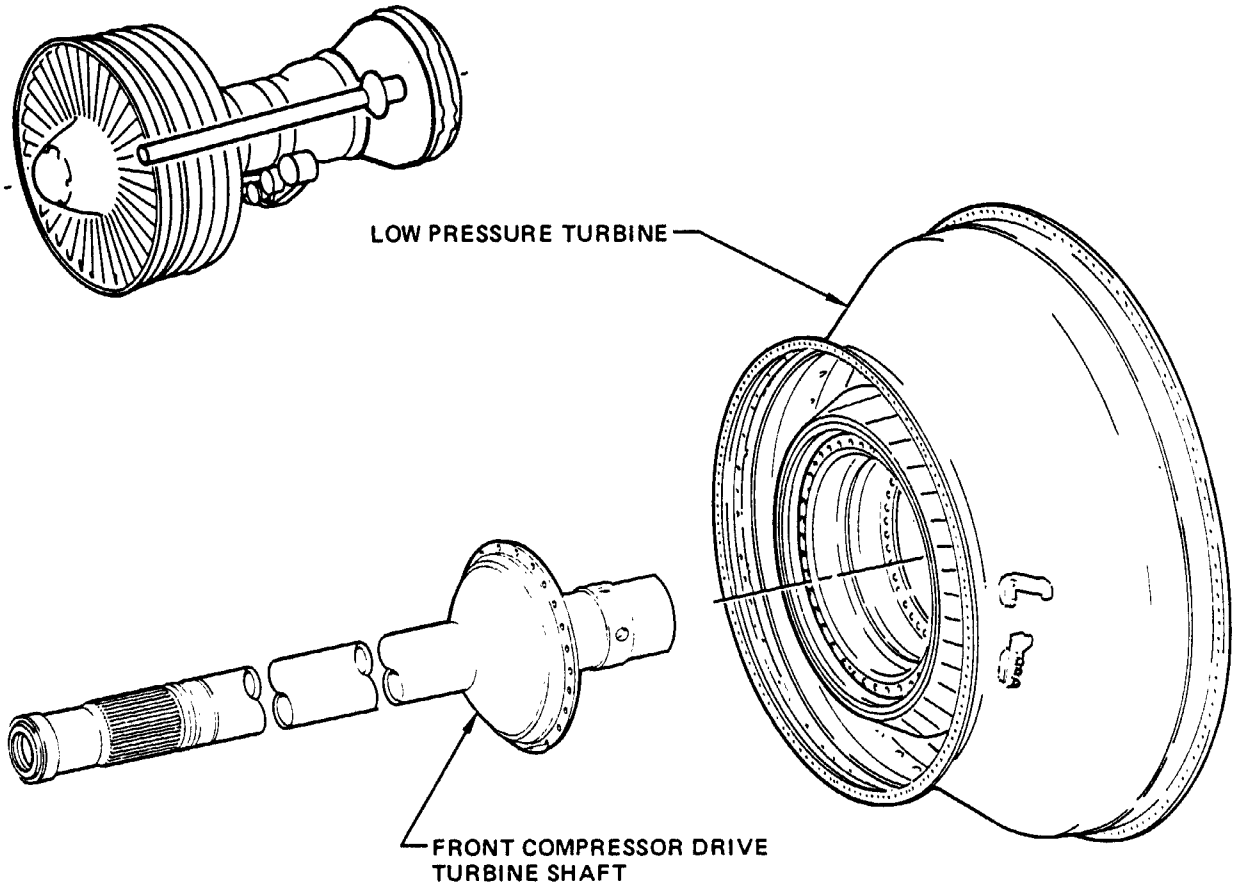
High Pressure Turbine (HPT)
Figure 016



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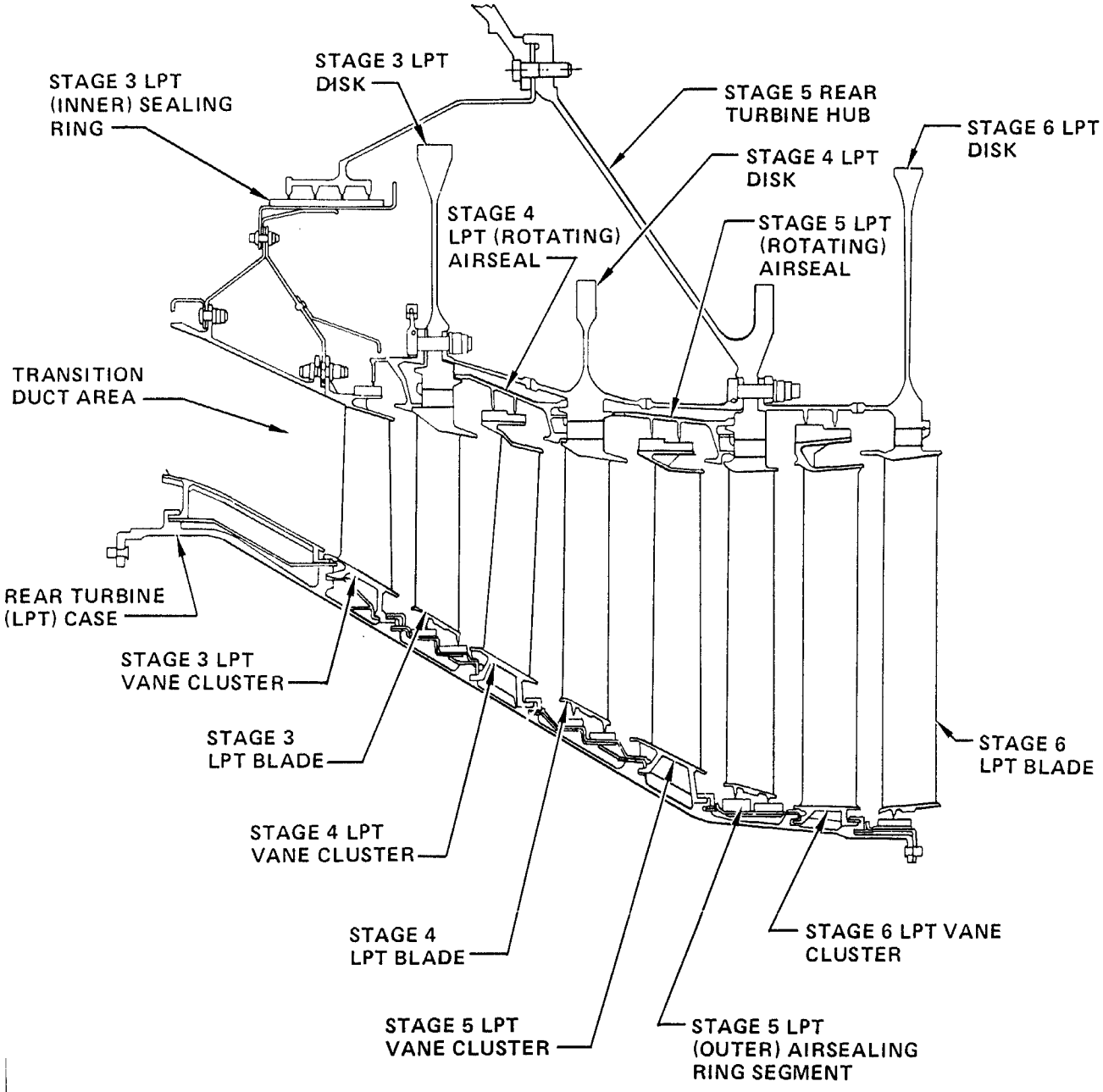
Low Pressure Turbine
Figure 017


STAGE 3 LPT (INNER) SEALING RING
STAGE 3 LPT DISK
STAGE 5 REAR TURBINE HUB
STAGE 6 LPT DISK
STAGE 4 LPT DISK
STAGE 4 LPT (ROTATING) AIRSEAL
STAGE 5 LPT (ROTATING) AIRSEAL
TRANSITION DUCT AREA
REAR TURBINE (LPT) CASE
STAGE 3 LPT VANE CLUSTER
STAGE 3 LPT BLADE
STAGE 6 LPT BLADE
STAGE 4 LPT VANE CLUSTER
STAGE 4 LPT BLADE
STAGE 6 LPT VANE CLUSTER
STAGE 5 LPT VANE CLUSTER
STAGE 5 LPT (OUTER) AIRSEALING RING SEGMENT
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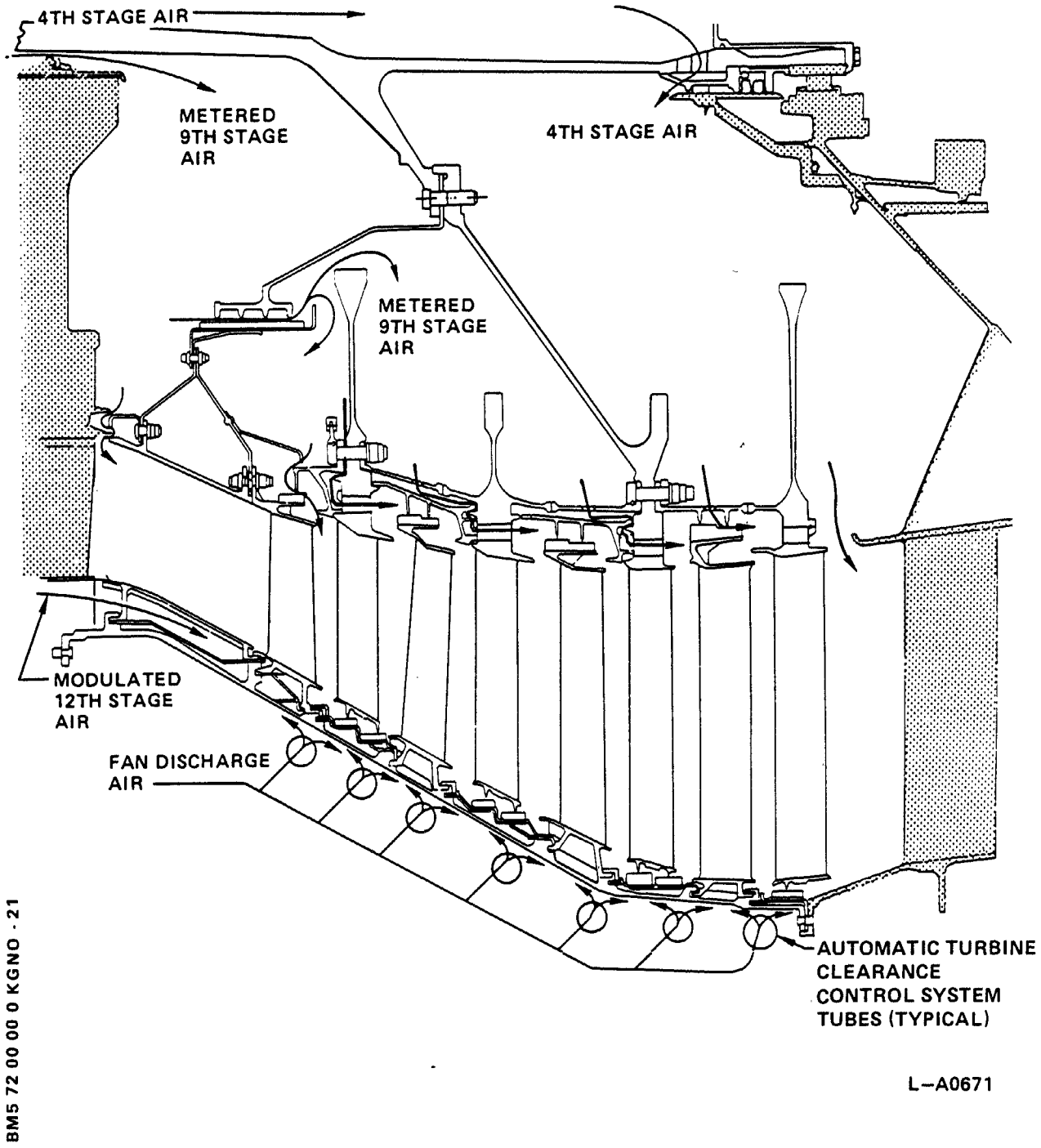
Low Pressure Turbine
Figure 018


4TH STAGE AIR
METERED 9TH STAGE AIR
4TH STAGE AIR
METERED 9TH STAGE AIR
MODULATED 12TH STAGE AIR
FAN DISCHARGE AIR
AUTOMATIC TURBINE CLEARANCE CONTROL SYSTEM TUBES (TYPICAL)
L-A0671
BM5 72 00 00 0 KGNO - 21

Low Pressure Turbine
Figure 019

porates aluminide-coated airfoils, with an aerodynamic transition duct directing gas flow exiting the high pressure turbine. The 3rd stage airseal land is bolted to the inner transition duct shroud and incorporates an abradable honeycomb airseal land in alignment with the four knife-edges of the 3rd stage (inner rotating) thrust balance airseal. Stages 4 through 6 stators incorporate, uncoated airfoils with integral, abradable honeycomb airseal lands on the ID. These seal lands are in alignment with the knife-edges of the 4th and 5th stage (rotating) airseals and the 6th stage disk to form the inner vane seals.

(g) The low pressure turbine case is a single piece, machined weldment of six nickel alloy forgings. Internal slotted supports provide hooked engagement with stator vane feet and with outer airseal shroud segments positioned behind each of the four vane stages. The outer airseal shroud segments incorporate abradable honeycomb rubstrips which align with knife-edge seals on turbine blade outer shrouds.

(h) Automatic turbine rotor clearance control system tubes surround the external surfaces of the low pressure turbine case, and impinge fan discharge air on the surface of the case to cool the case during cruise power operation. Cooling the case surface results in shrinkage of the case, with decreased tip clearances between the blade tips and airseal lands, resulting in improved turbine efficiency.

(5) Turbine Exhaust Case (Ref. Fig. 020, 021)

(a) The turbine exhaust case assembly is a main structural support member of the engine and provides a housing for the rear (LPT) shaft bearing (No. 4 Bearing). This structural case provides the aft attachment point for the power plant to the aircraft pylon (strut). Rear ground handling tool attachment points are also located on this case.

(b) The turbine exhaust case is the transition duct for the exhaust gas flow from divergent (through the turbines) to convergent (through the exhaust nozzle).

(c) Provisions are made in the rear mount rails for the attachment of the engine (lower) aft mount links to carry engine vertical, side and torsional loads to the airframe structure. The engine rear ground handling provisions consist of two holes through the rear mount rail on the horizontal centerline.

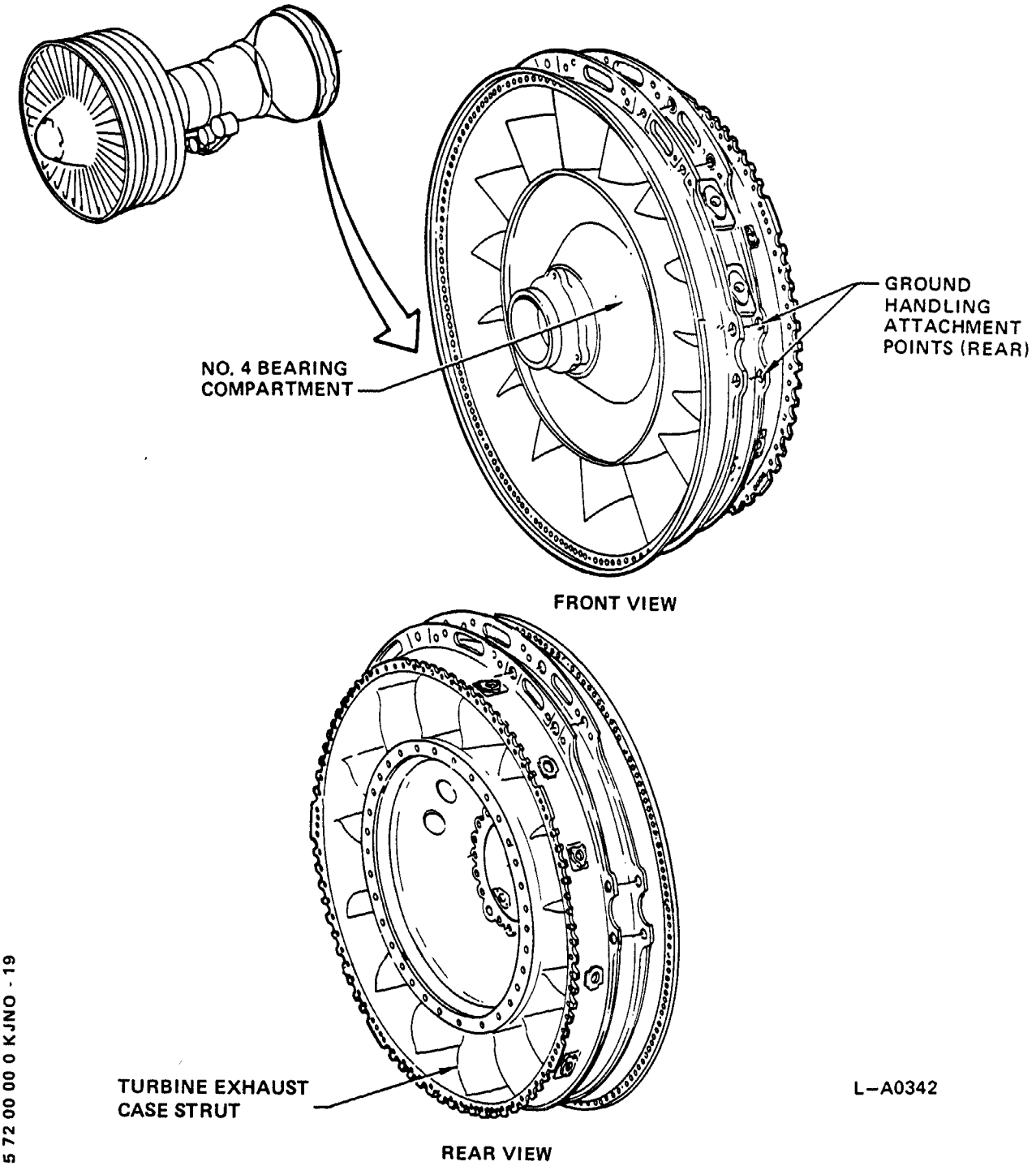
(d) Probes are installed between the exhaust case struts at four locations. At two locations probes measure gaspath total temperature (T4.95). At the other two locations, probes measure gaspath total temperature and total gaspath pressure.

G. Accessory Drives

(1) Main Gearbox (Ref. Fig. 022)

(a) Main gearbox power to drive the engine and aircraft supplied accessories is obtained from the high pressure compressor rotor (HPC). A towershaft in the intermediate case is geared to the front of the rotor.

(b) The towershaft drives the angle gearbox bevel gear set which transmits power to the main gearbox group through the gearbox driveshaft assembly. The angle gearbox is located in the intermediate case group completely enclosed between the fan exit case rear and the intermediate case OD wall.



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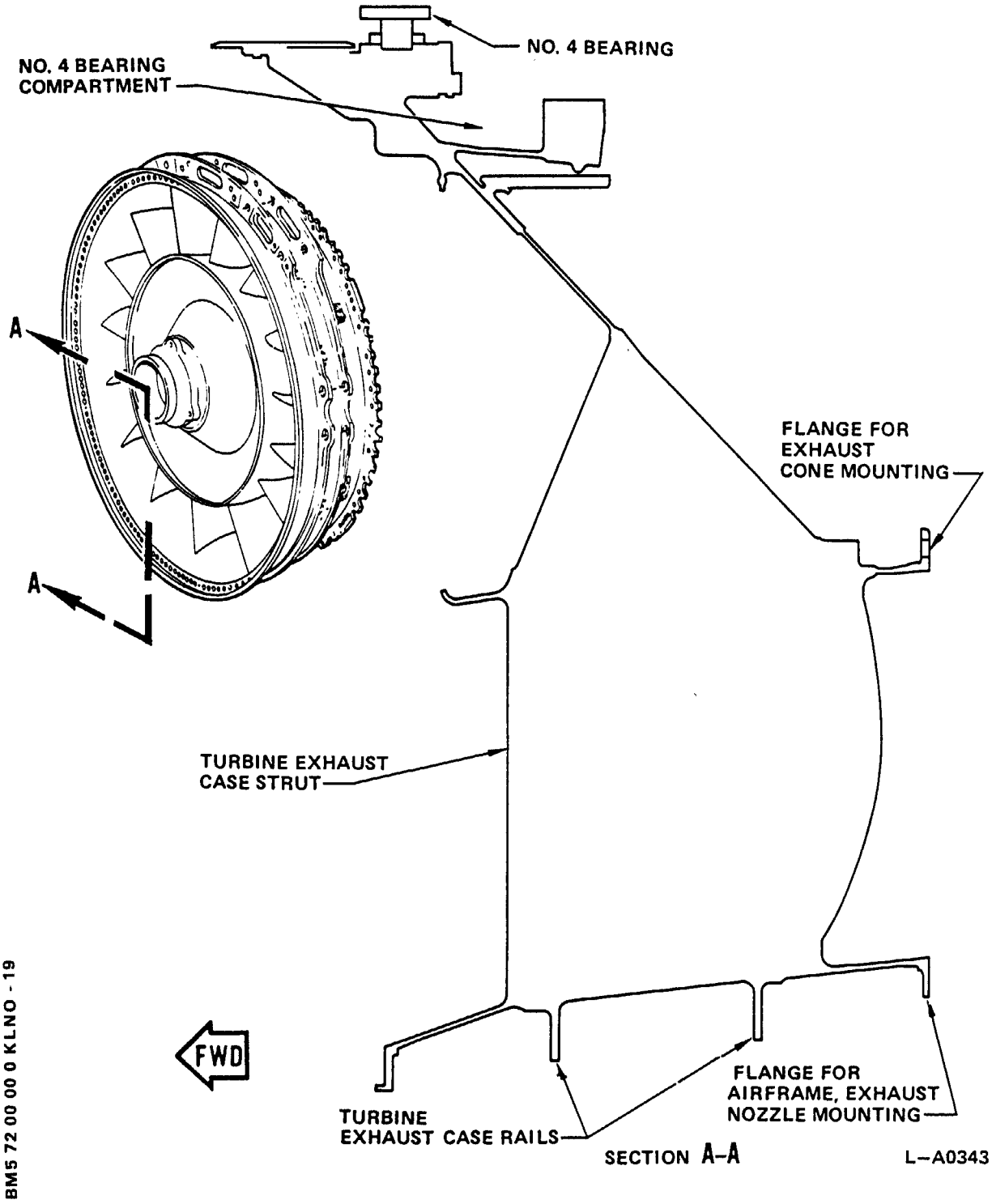
Turbine Exhaust Case
Figure 020



Turbine Exhaust Case
Figure 021

(c)The main gearbox group incorporates drive pads for the engine fuel pump and fuel metering unit (tandem mounted), engine hydraulic pump(s), the starter, the integrated drive generator system. Provisions are also incorporated to permit hand cranking of the high compressor rotor to allow more complete inspection through the borescope ports.

(d)The gearbox engine accessories include an electronic engine control alternator, a lubrication and scavenge oil pump module and an oil filter housing.

H. - The No. 1 bearing is the thrust bearing for the Low Pressure Rotor and consists of a split inner race, angular contact ball bearing mounted aft of the fan rotor in a relatively cool area. Lubrication and cooling oil is supplied under the inner race and introduced to the bearing through the inner race split.

- The No. 1.5 bearing is a standard non-preloaded cylindrical roller bearing which radially supports the low compressor drive turbine shaft coupling. It is mounted at the forward end of the intermediate case. Lubrication for the front seal and the bearing is provided by a single jet directed at the front of the seal plate. Lubrication for the rear seal plate is provided by use of an axial scoop.
- The No. 2 bearing is the thrust bearing for the High Pressure Rotor and consists of a split inner race, angular contact ball bearing mounted forward of the high compressor rotor. The lubrication features are similar to the No. 1 bearing.
- The No. 3 bearing is a preloaded cylindrical roller bearing mounted forward of the high pressure turbine. The preload to prevent skidding is mechanically applied by grinding the outer surface of the outer race elliptical and the inner surface of outer race round. Mounting this race in a round housing forces the inner surface to assume an elliptical shape, thereby creating a two-point preload of the bearing. The retainer is a one piece inner land riding cage, silver plated. Cooling oil is fed under the race and lubrication is provided by splash oil from the seal plates and scoop.
- The No. 4 bearing is a standard non-preloaded cylindrical roller bearing mounted aft of the front compressor drive turbine. Lubrication features are similar to the No. 3 bearing.

I. Bearing Support

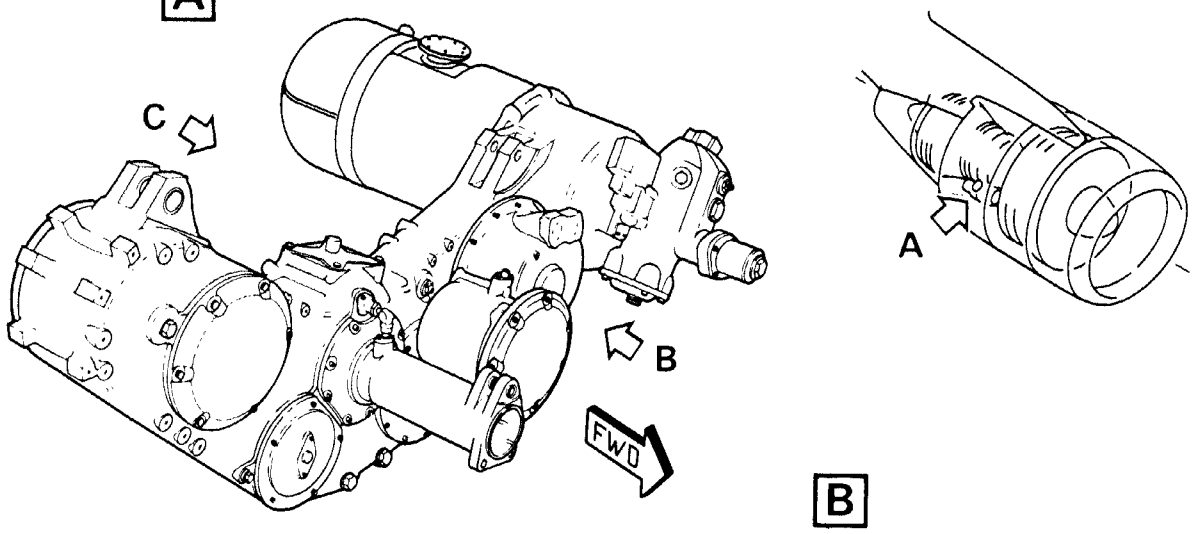
The engine incorporates three main bearing supports structures : both the low pressure and high pressure compressor rotors are supported at the front by the intermediate case structure. The high pressure compressor and high pressure turbine are supported by the diffuser case structure and the low pressure turbine is supported by the turbine exhaust case structure.
All bearing support structures consists of a system of inner and outer cones or rings connected through the flow path by airfoil shaped struts.

(1)Intermediate case group support

The loads from the Nos. 1, 1.5 and 2 bearings are carried by the compressor intermediate case across the engine flowpath to the fan exit rear case.

(2)Diffuser and combustion group case support

The inner section of the diffuser case provides structural support for



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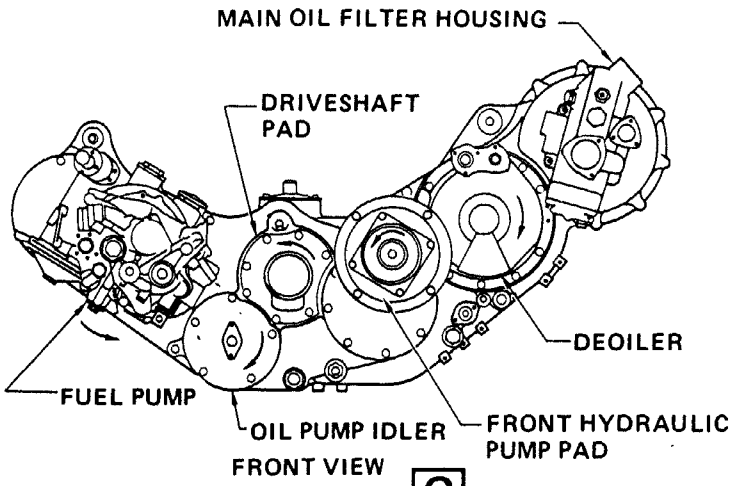
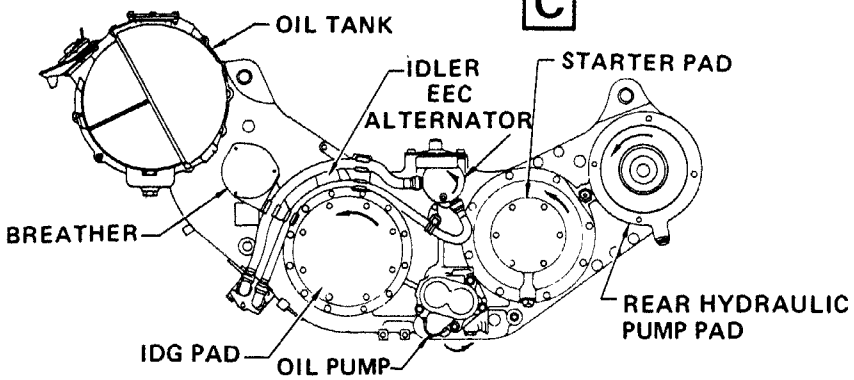


FRONT VIEW

C



REAR VIEW

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Accessory Drives - Main Gearbox
Figure 022

the No. 3 bearing compartment and is connected radially to the outer section by 24 struts. Bearing loads are carried from the inner case through the struts to the outer case.

(3)Turbine exhaust case group support
The inner cone section of the turbine exhaust case provides structural support for the No. 4 bearing compartment. Bearing loads are transferred to the outer case section through 15 radial struts.

J. Bearing Compartment Seal Pressurization
The main bearing carbon seals are pressurized by compressor air to ensure that oil is not permitted to enter the airstream as follows.

(1)No. 1, 1.5 and 2 bearing compartment
The carbon seals in this area are dry face spring loaded seals.
The No. 1 and 2 bearing carbon seals are pressurized by station 2.5 low pressure compressor bleed air.
The No. 1.5 bearing carbon seals are pressurized by 9th stage HPR bleed air.

(2)No. 3 bearing compartment
The No. 3 bearing carbon seals are spring-loaded wet face carbon seals.
The carbon seals are pressurized by 12th stage HPR bleed air that has passed through an air/air heat exchanger located in the fan exit/intermediate case.

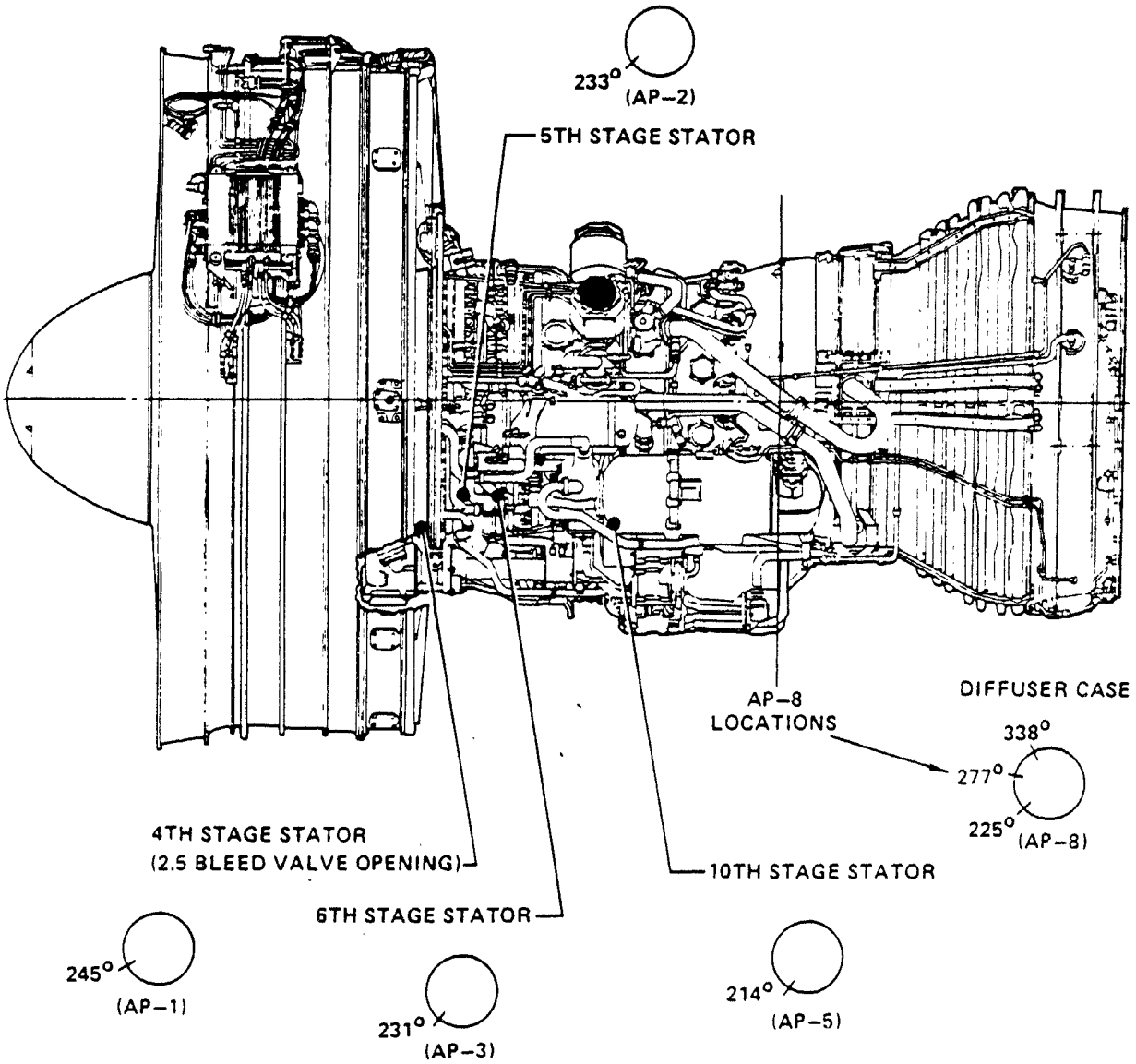
(3)No. 4 bearing compartment
The No. 4 bearing carbon seal is a dry face ring seal.
This carbon seal is pressurized by LPR station 2.5 air that enters the LPT shaft forward of the No. 1 bearing.

2. Borescope Port Location (Ref. Fig. 023, 024, 025)
(Ref. Fig. 026, 027, 028)
Inspection of internal areas of the engine is facilitated by 16 borescope access ports at specific locations around the engine. These ports permit visual analysis of part condition in areas not otherwise accessible without engine disassembly.
Borescope port locations (Right Side) :

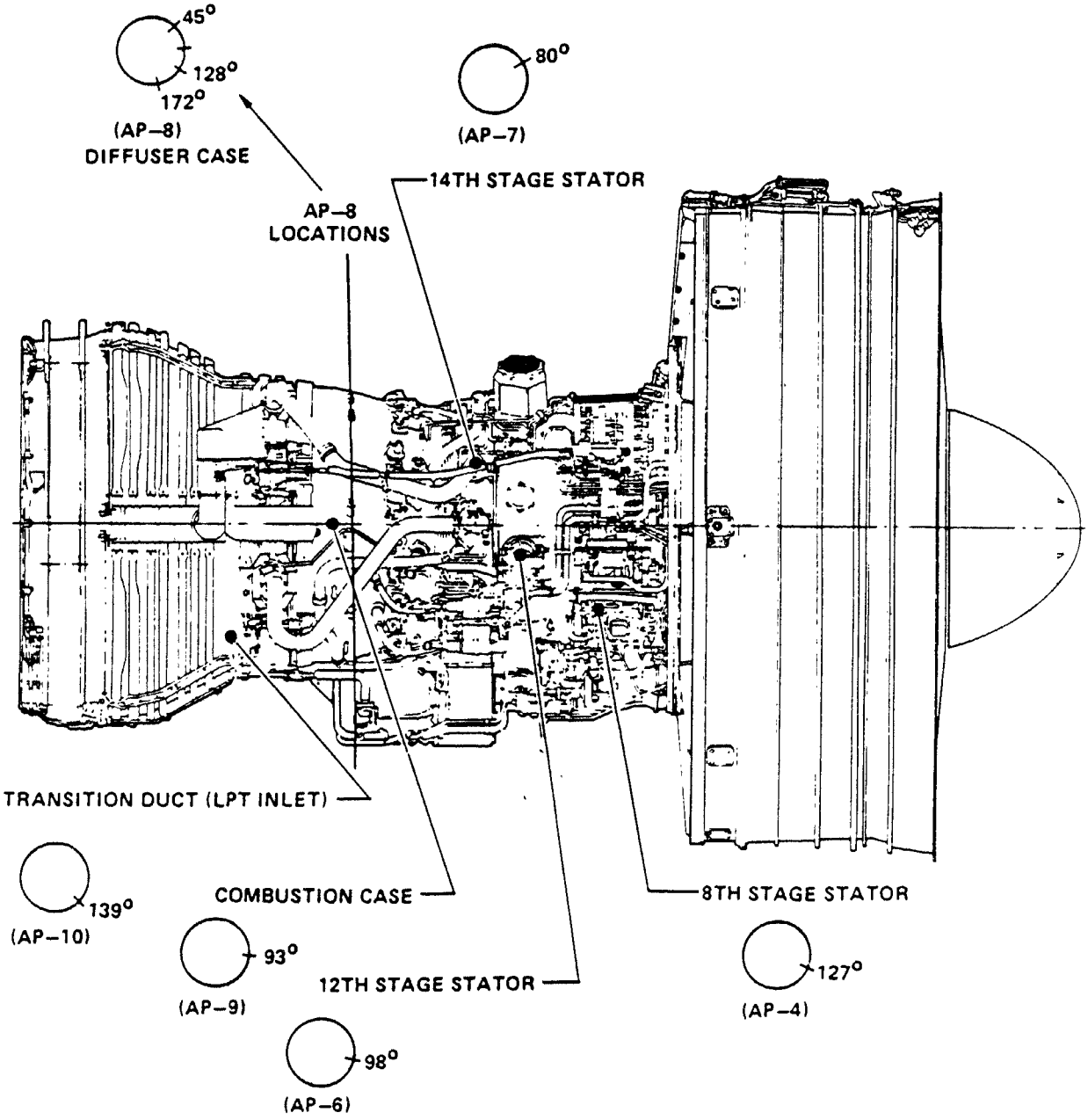
Borescope Access Port Location (rear view)	Viewing Capability
AP-4	8th And 9th Stage Blades
AP-6	12th And 13th Stage Blades
AP-7	14th And 15th Stage Blades
AP-8	Combustion Liner And Fuel Injectors
AP-9	1st Stage HPT Blades And Vanes
AP-10	2nd HPT Blades And 3rd LPT Vanes

Borescope port locations (Left Side) :

Borescope Access Port Location (rear view)	Viewing Capability
AP-1	4th Stage Blades
AP-2	5th And 6th Stage Blades
AP-3	6th And 7th Stage Blades
AP-5	10th And 11th Stage Blades
AP-8	Combustion Liner And Fuel Injectors



Borescope Access Ports - Left Side
Figure 023



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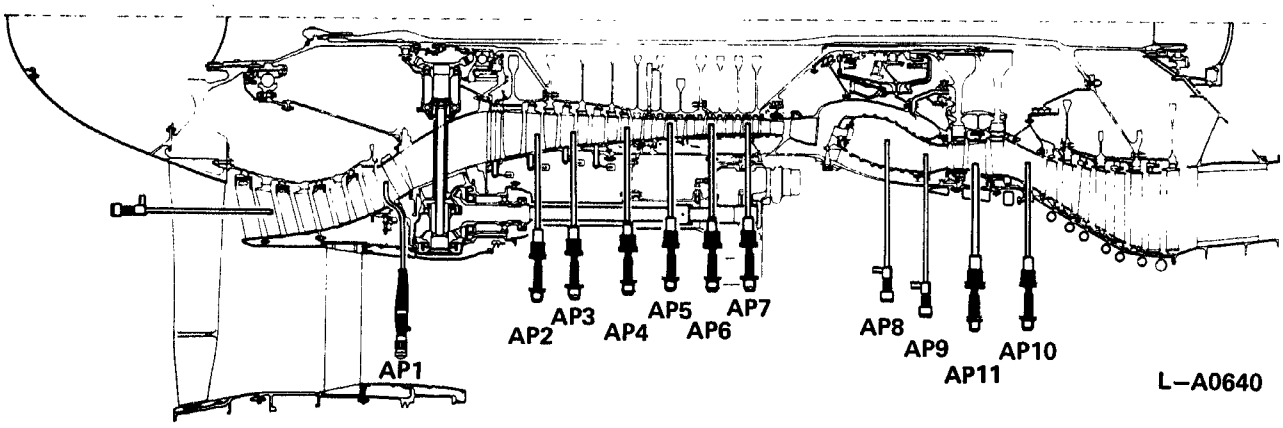
Borescope Access Ports - Right Side
Figure 024



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Borescope Access Port Locations
Figure 025

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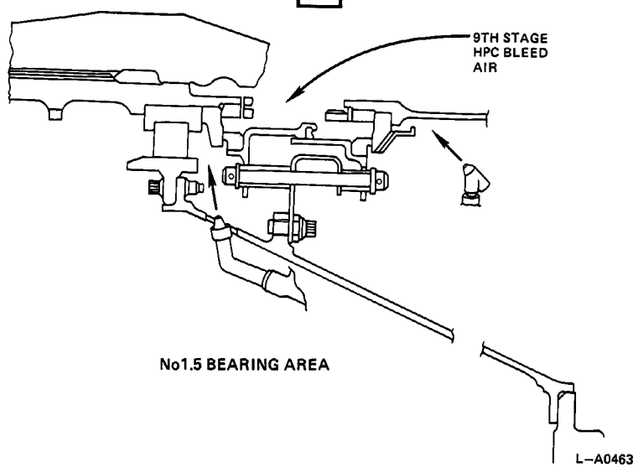

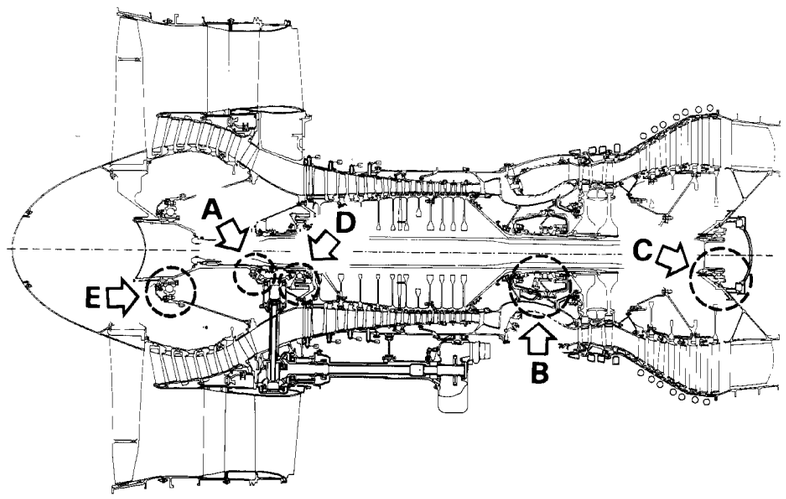

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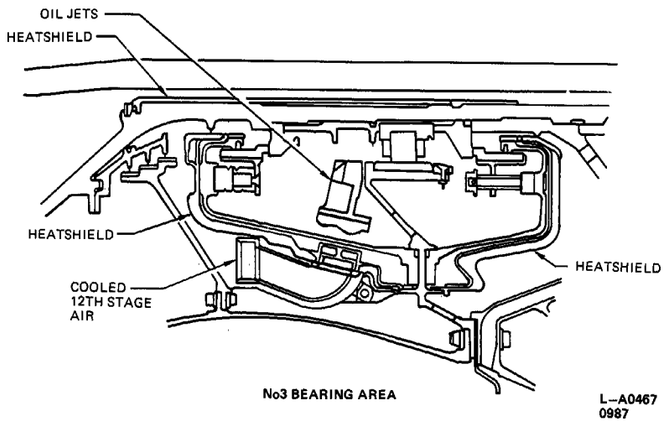

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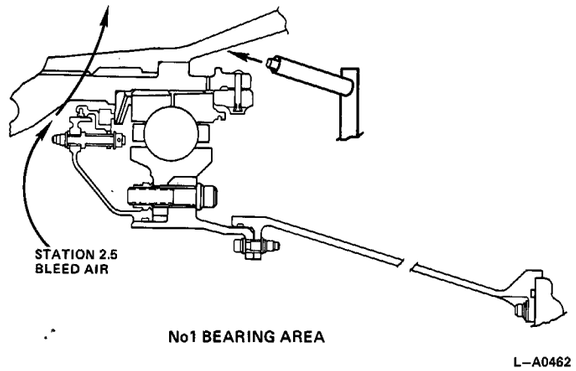

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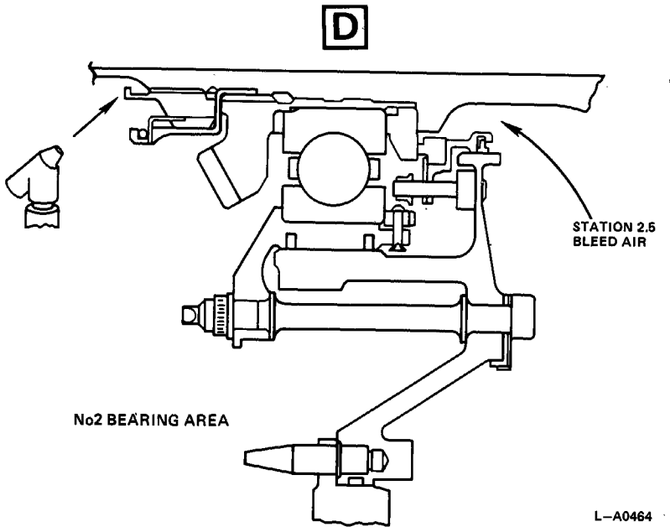

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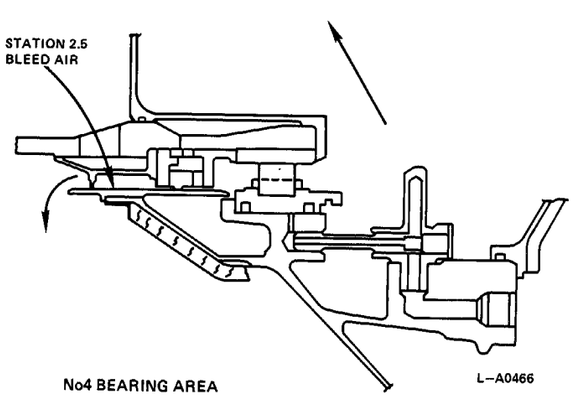

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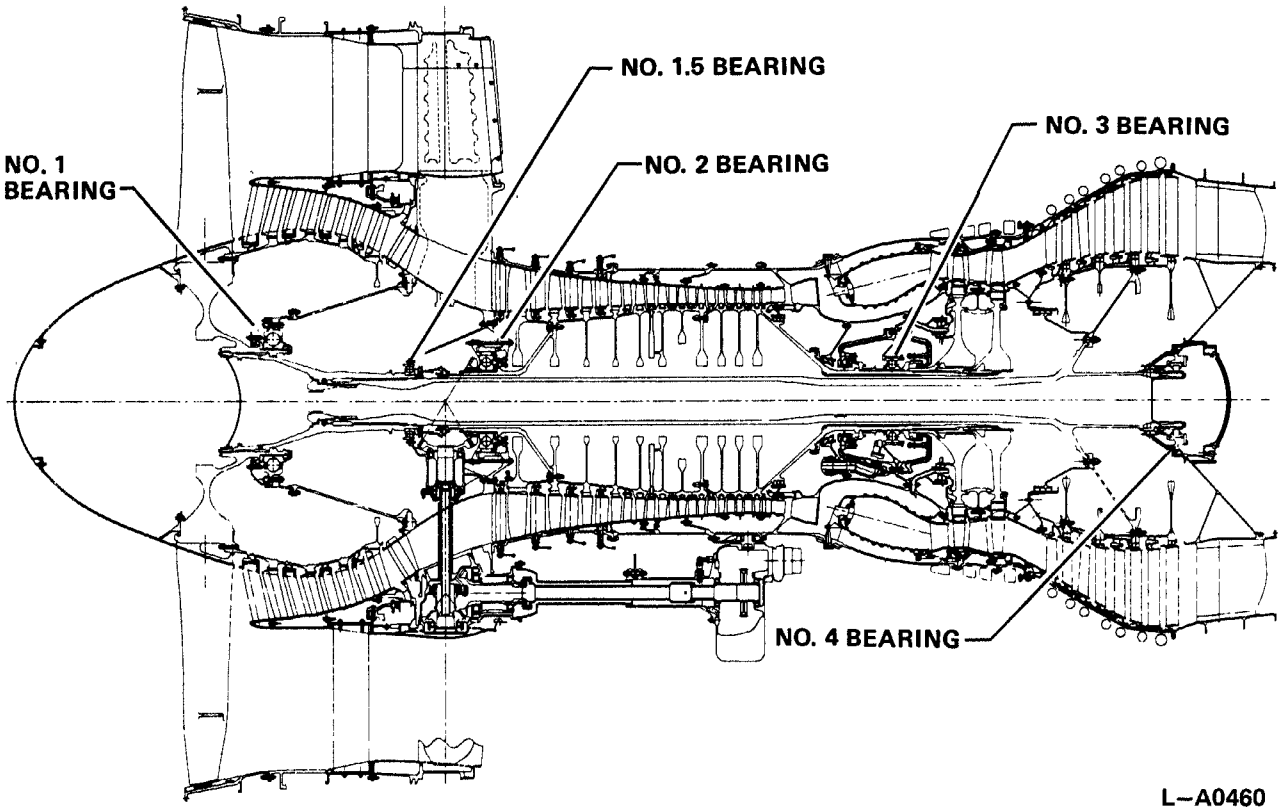
Bearing Area Locations
Figure 026



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Main Bearing Identification
Figure 027

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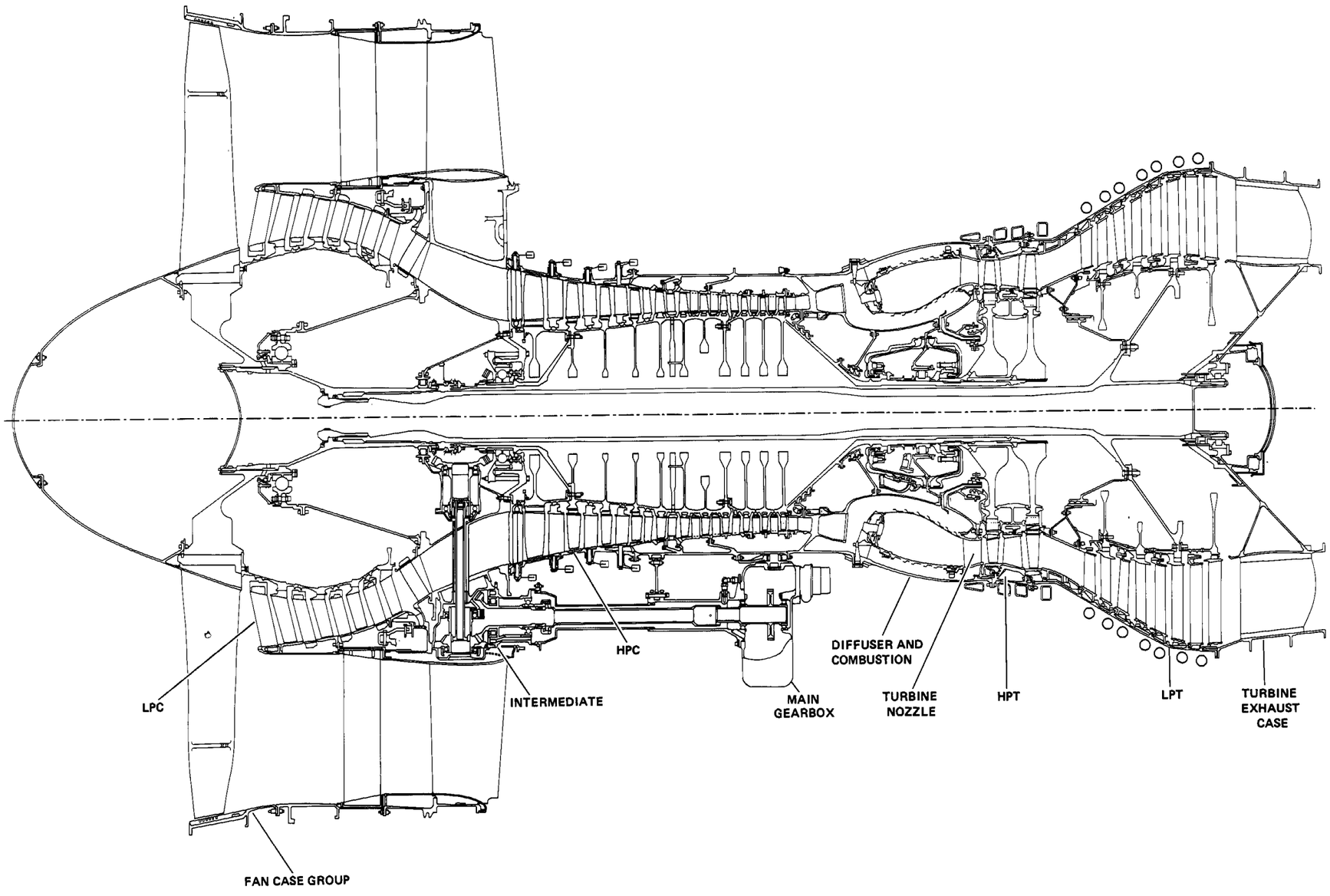

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Engine Build Groups
Figure 028

1. Hot Oil Flush

A. Equipment and Materials

ITEM	DESIGNATION
A. CTE9060	Hot Oil Cart
B. PWA85525	Adapter
C. PWA85526	Adapter
D. Material No.P03-001	Oils (Ref. 70-00-00)
E. Material No.P03-003	Oils (Ref. 70-00-00)
G. Material No.P06-003	Lubricants (Ref. 70-00-00)
I.	Packing
J.	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00)
K.	Torque Wrench
L.	Container 50 Gallons (200 l)

B. Procedure (Ref. Fig. 201, 202, 203)

(1)Service the cart, CTE9060, as follows :

(a)Drain any residual water or contaminants from reservoir, connecting lines and hydraulic system.

(b)Close outlet valve from reservoir. Remove cap and connect oil supply to filling connection.

NOTE : Reservoir may be filled through inlet line if more convenient.

(c)Open vent valve and inlet valve. Fill reservoir with approximately fifty gallons (200 l) of, jet engine oil or until overflow occurs from vent.

NOTE : Engine Oil (Material No.P03-001), of same type and brand as used in engine must be used to service cart.

(d)Close inlet valve and cap filling connection.

(e)Set temperature controller in control cabinet at 300°F (149°C).

WARNING : CUT OFF POWER SUPPLY BEFORE CONNECTING OR DISCONNECTING LEADS TO CART OR BEFORE OPENING CONTROL CABINET.

(2)Do the heating cycle as follows :

(a)Connect electrical leads to cart, to facility power supplies.

NOTE : When heating a charge in reservoir for recycling, initially set temperature controller at 225°F (107.2°C) and allow approximately one hour stabilizing period, or until evaporation of moisture through vent is complete, before heating to 300°F (149°C).

(b)Energize cart electrical circuits sequentially :

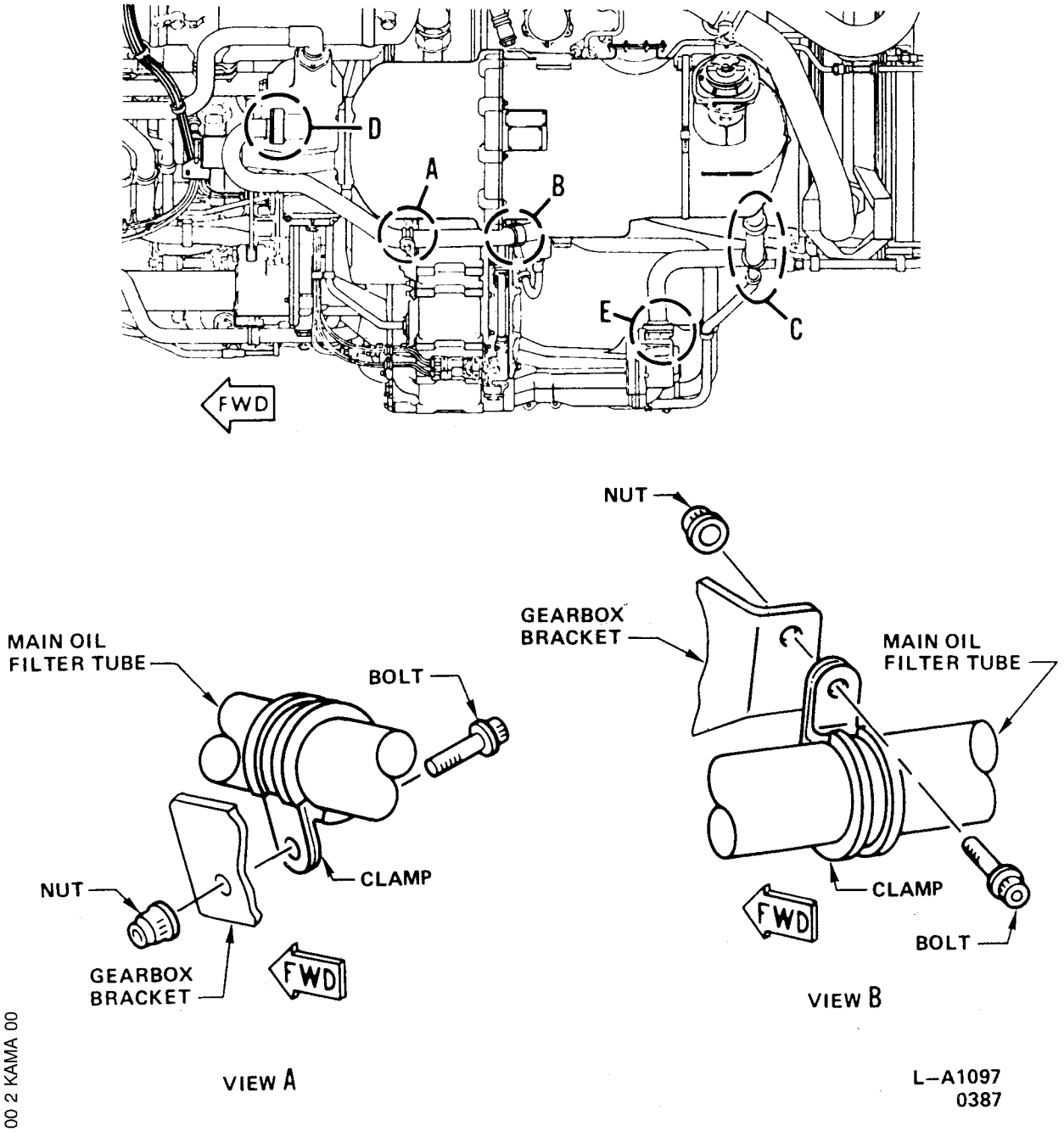
1 Power supply
2 Circulating pump
3 Heating elements

CAUTION : TEMPERATURE INDICATOR AND TEMPERATURE CONTROLLER ARE RED LINED AT 310°F (154°C) TO PREVENT INADVERTANT OVER-TEMPERATURE OF OIL AND FORMING OF COKE ON HEATING ELEMENTS.

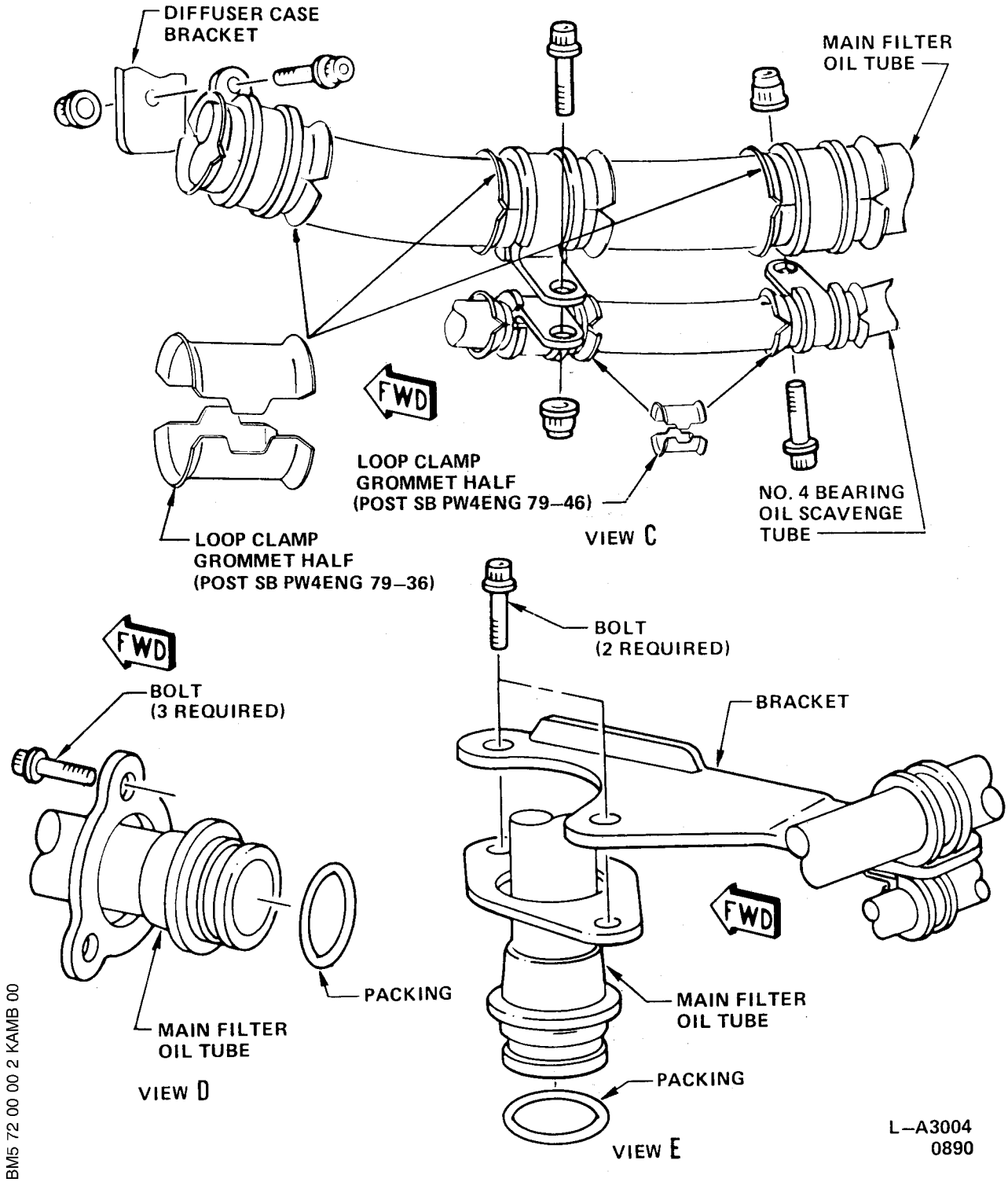
(c)Stabilize at set temperature until ready to service engine.
NOTE : Check for overflow from vent when set temperature is reached. Add oil as necessary to completely fill reservoir.

(3)Prepare engine for motoring per standard procedure and as follows :
(a)Remove inlet, duct and tailpipe covers as applicable.
(b)Remove rotor and bleed actuator locking devices as applicable.
(c)Install necessary air ducts to starter duct system and connect to ground starting units.
(d)(Pre SB PW4ENG 79-75) Remove main filter oil tube assembly (LP01) from engine as follows (Ref. Fig. 201) :
1 Remove lockwire and bolts securing forward end of tube to main oil filter and rear end of tube to top of oil pump.
2 Remove bolts, nuts and clamps securing tube and remove tube from engine. Discard packings.
(e)(Post SB PW4ENG 79-75) Remove the main oil filter hose and tube assembly (LP01) and the fluid pressure dampener or (Post SB PW4ENG 79-86) adapter, if applicable, as follows (Ref. Fig. 202, 203) :
1 Remove bolts securing tube to front of main oil filter housing.
2 Remove the bolts that hold the tube to the top of the fluid pressure dampener or adapter.
3 Remove bolt, nut and clamp securing tube to diffuser case bracket at approximately 7 o'clock position.
4 Remove bolts, nuts and clamps securing tube to gearbox brackets and remove tube from engine.
5 If applicable, remove the bolts that hold the fluid pressure dampener or adapter to the top of the main oil pump.
6 If applicable, remove the loop clamp bracket from the dampener or adapter.
7 If applicable, remove the dampener or adapter from the engine.
8 Discard packings from the hose and tube assembly and the filter.
(f)Install PWA85525 Adapter to pad on main oil filter housing and secure with bolts.
NOTE : Ensure packing is installed on adapter prior to installation.
(g)Install PWA85526 Adapter to pad on top, rear of oil pump and secure with bolts.
NOTE : Ensure packing is installed on adapter prior to installation.
(h)Drain and refill engine oil tank.
(i)Terminate heat cycle on cart, disconnect power leads and transport cart to service area.

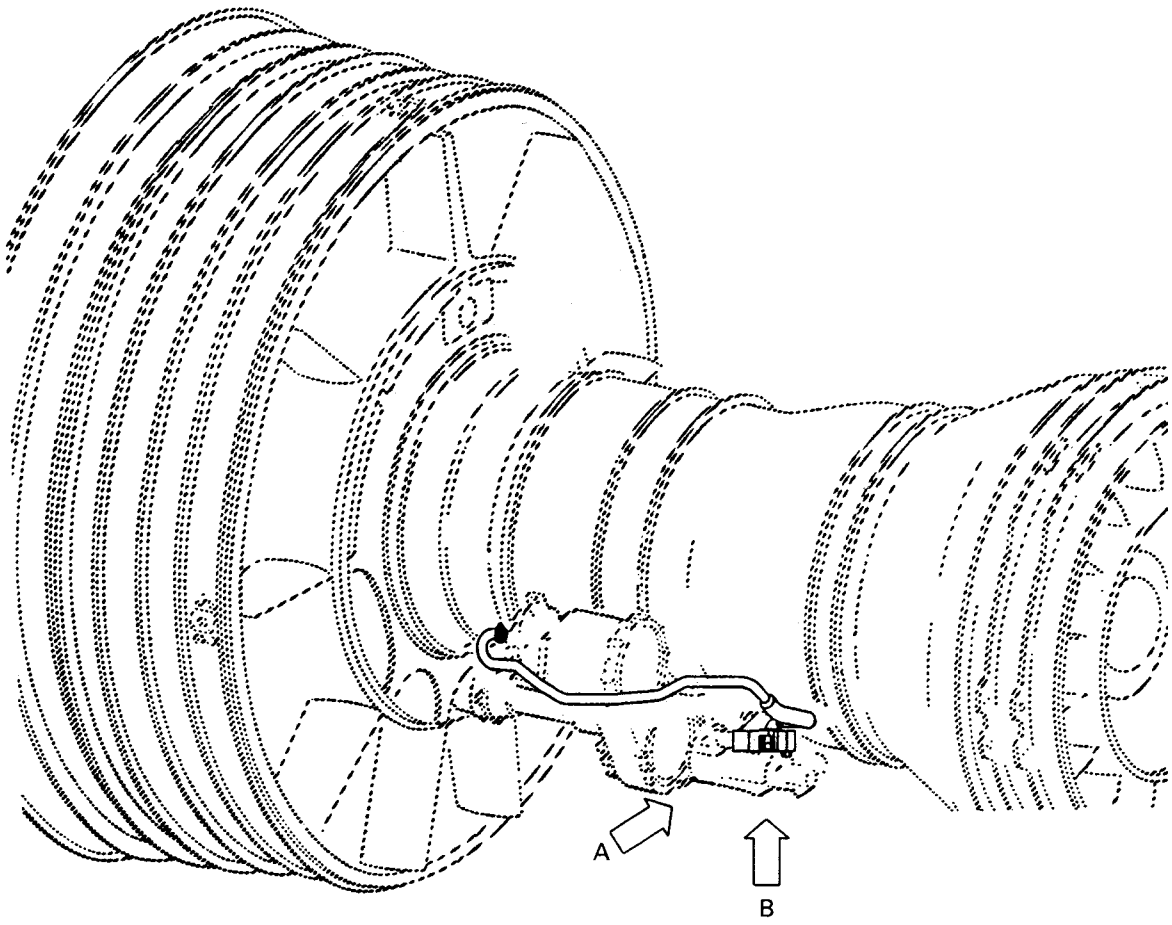
(4)Service the engine as follows :
(a)Connect outlet hose from hot oil cart to adapter on main oil filter housing and inlet hose to adapter on top rear of oil pump.
(b)Close vent valve on reservoir.
(c)Open inlet and outlet valve to reservoir.
(d)Prepare engine for motoring.
CAUTION : RESERVOIR MUST BE FULL, INLET AND OUTLET VALVES OPEN, AND VENT VALVE CLOSED TO PREVENT POSSIBLE DAMAGE TO BEARINGS WHEN MOTORING ENGINE.
(e)Motor engine for minimum period of three minutes.
Monitor build up and stabilized level of pressure in reservoir during motoring of engine.



Main Oil Filter Tube Assembly
(Pre SB PW4ENG 79-75) (Sheet 1/2)
Figure 201



Main Oil Filter Tube Assembly
(Pre SB PW4ENG 79-75) (Sheet 2/2)
Figure 201

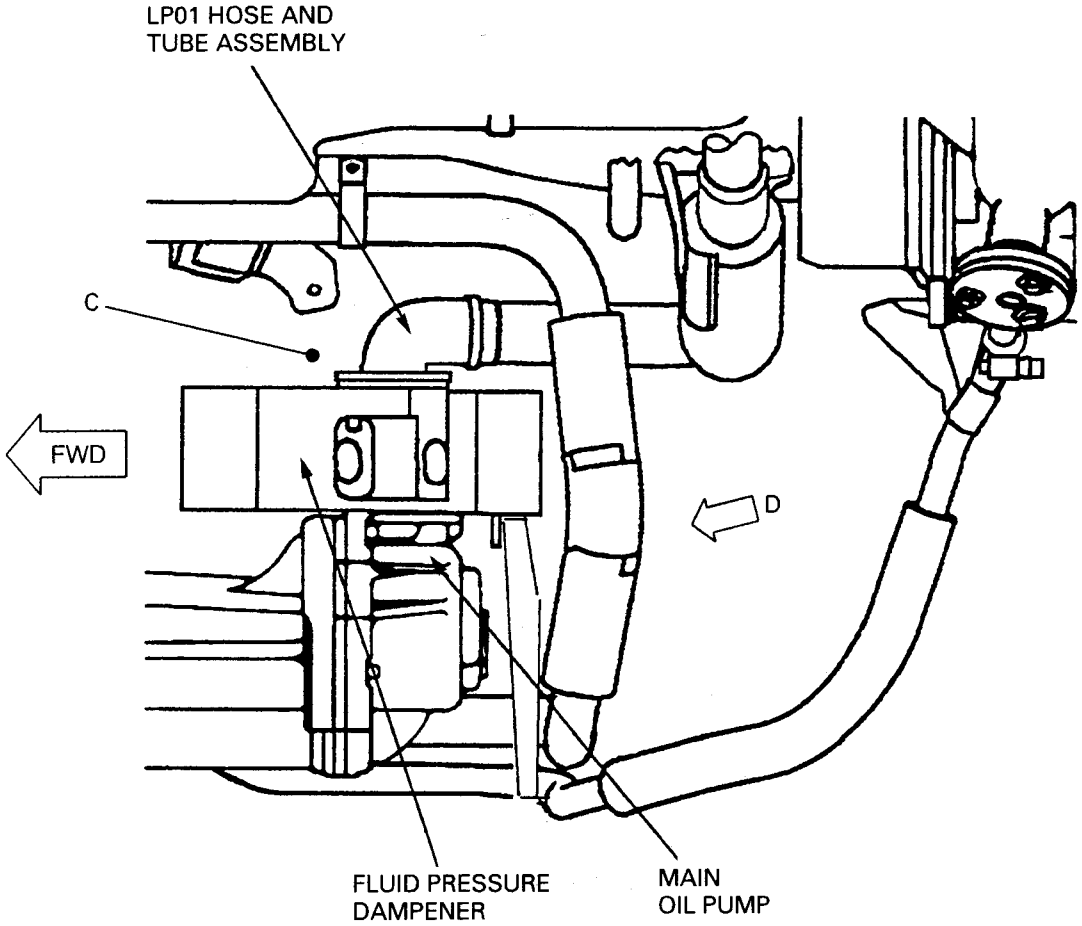


ENGINE LEFT SIDE VIEW

BM5 72 00 00 2 KCMA 00

L-B2502 (0000)

Main Oil Filter Tube Assembly
(Post SB PW4ENG 79-75) (Sheet 1/11)
Figure 202

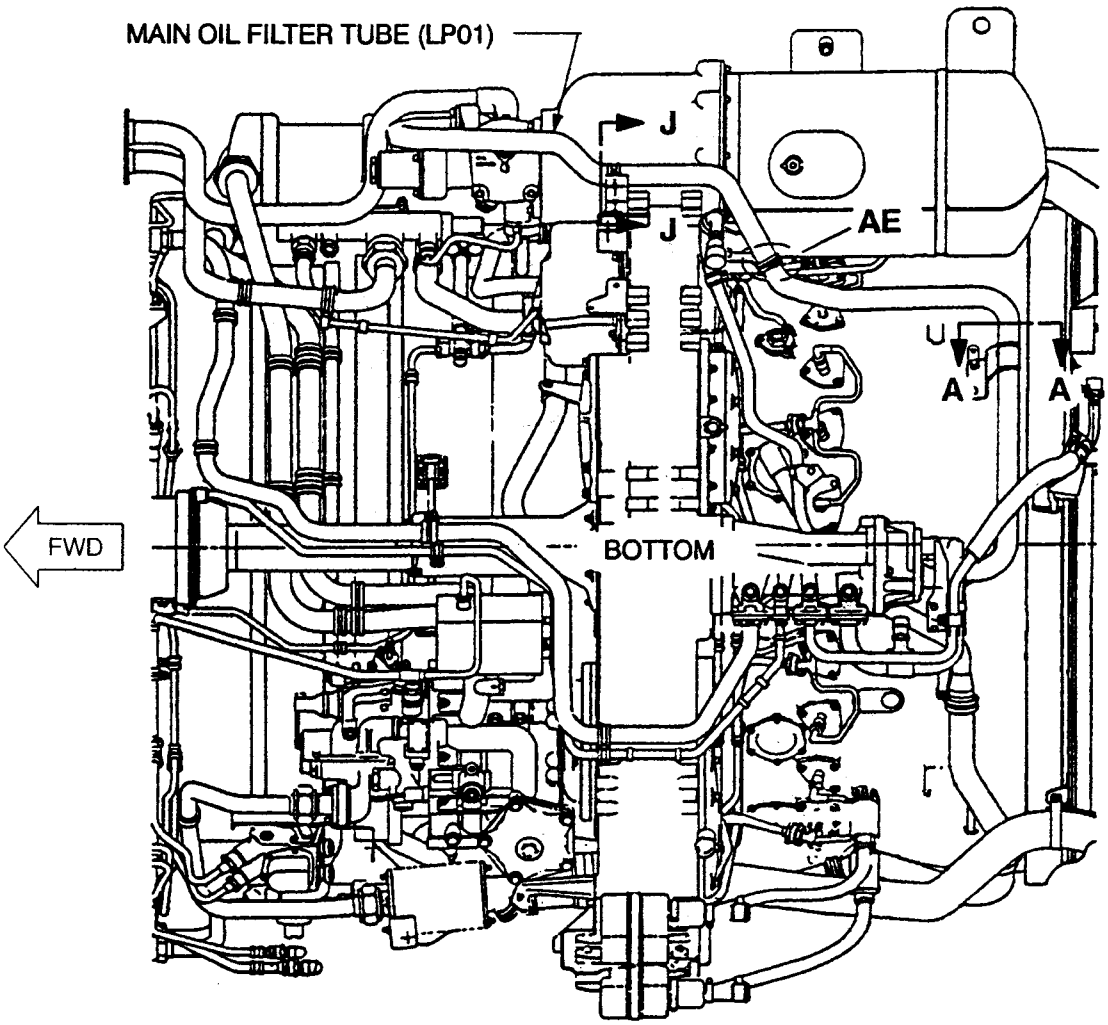


VIEW A

L-B2503 (0000)

BM5 72 00 00 2 KCMB 00

Main Oil Filter Tube Assembly
(Post SB PW4ENG 79-75) (Sheet 2/11)
Figure 202

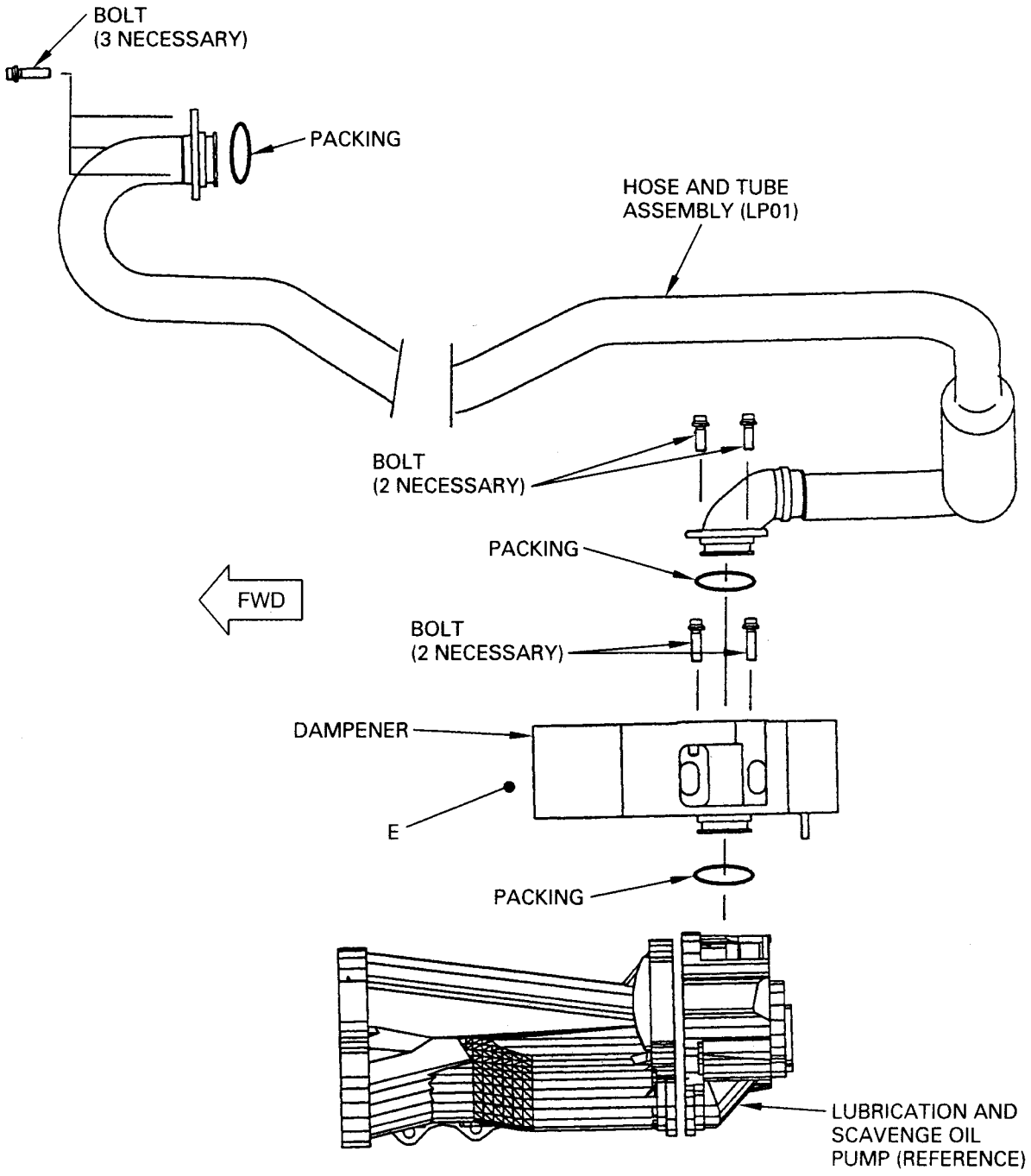


VIEW B
(ENGINE BOTTOM VIEW)

BM5 72 00 00 2 KCMC 00

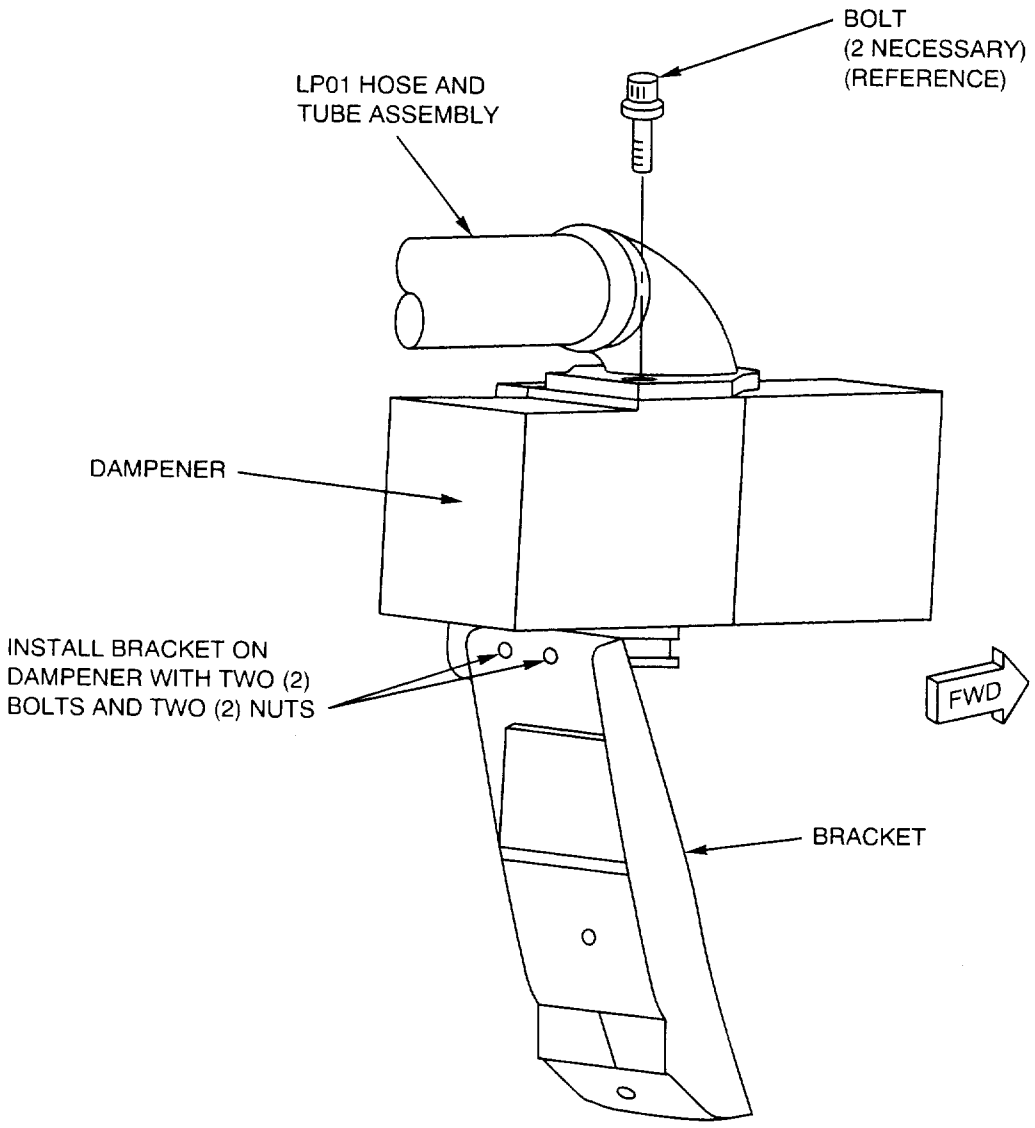
L-B2504 (0000)

Main Oil Filter Tube Assembly
(Post SB PW4ENG 79-75) (Sheet 3/11)
Figure 202



BM5 72 00 00 2 KCMD 00

Main Oil Filter Tube Assembly
(Post SB PW4ENG 79-75) (Sheet 4/11)
Figure 202

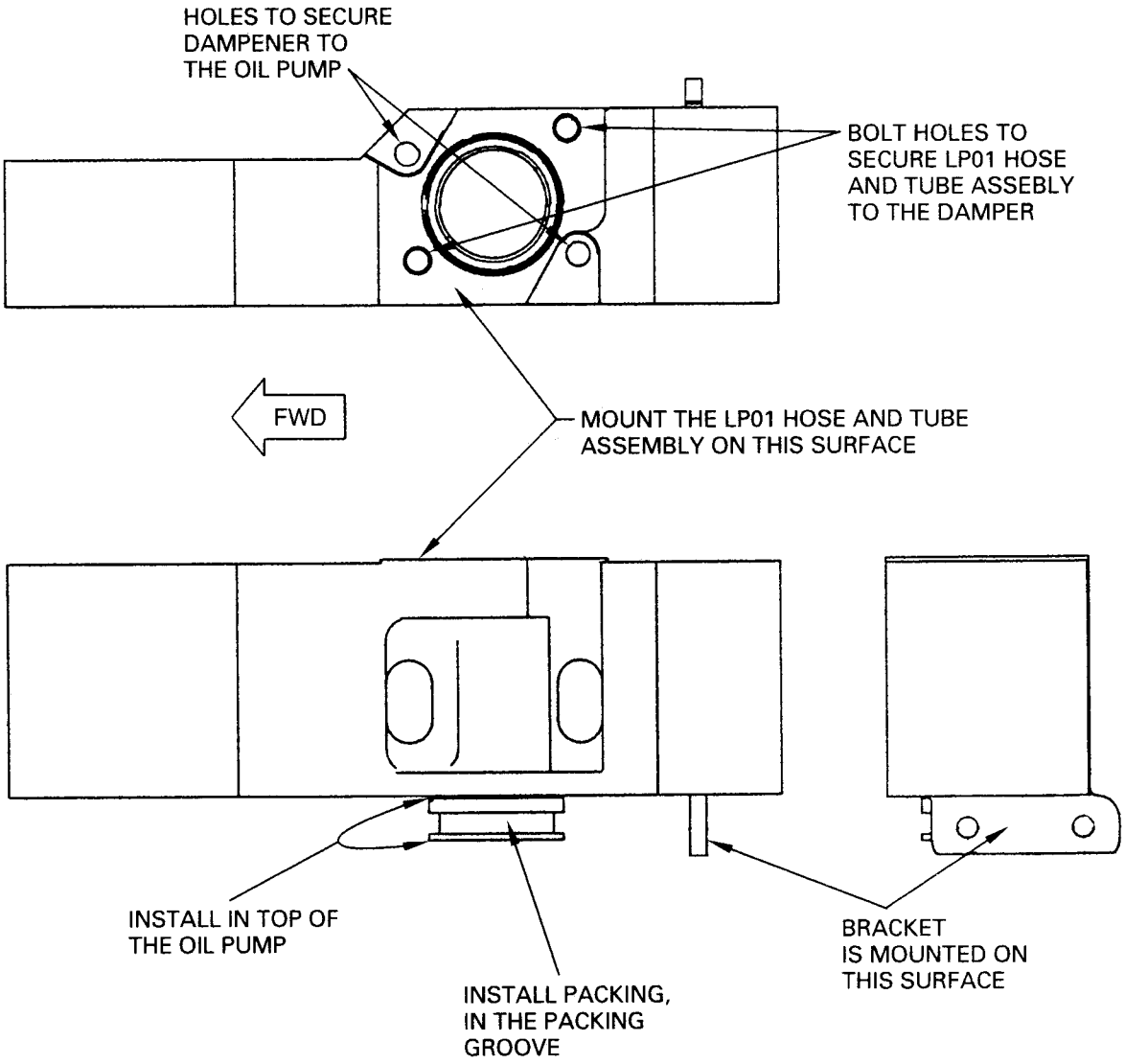


VIEW D
(SHOWS NEW CONFIGURATION
WITH OIL PUMP OMITTED)

L-B2506 (1297)
PW V

BM5 72 00 00 2 KCME 02

Main Oil Filter Tube Assembly
(Post SB PW4ENG 79-75) (Sheet 5/11)
Figure 202

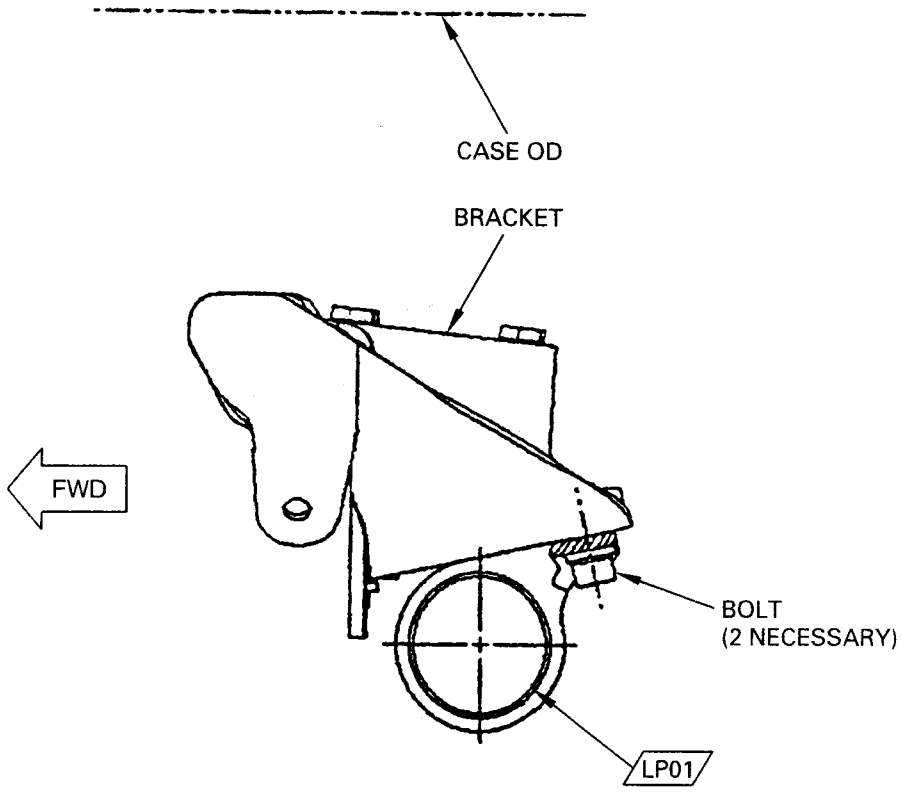

HOLES TO SECURE DAMPENER TO THE OIL PUMP
BOLT HOLES TO SECURE LP01 HOSE AND TUBE ASSEBLY TO THE DAMPER
FWD
MOUNT THE LP01 HOSE AND TUBE ASSEMBLY ON THIS SURFACE
INSTALL IN TOP OF THE OIL PUMP
INSTALL PACKING, IN THE PACKING GROOVE
BRACKET IS MOUNTED ON THIS SURFACE

VIEW E

L-B2507 (0000)

BM5 72 00 00 2 KCMF 00

Main Oil Filter Tube Assembly
(Post SB PW4ENG 79-75) (Sheet 6/11)
Figure 202

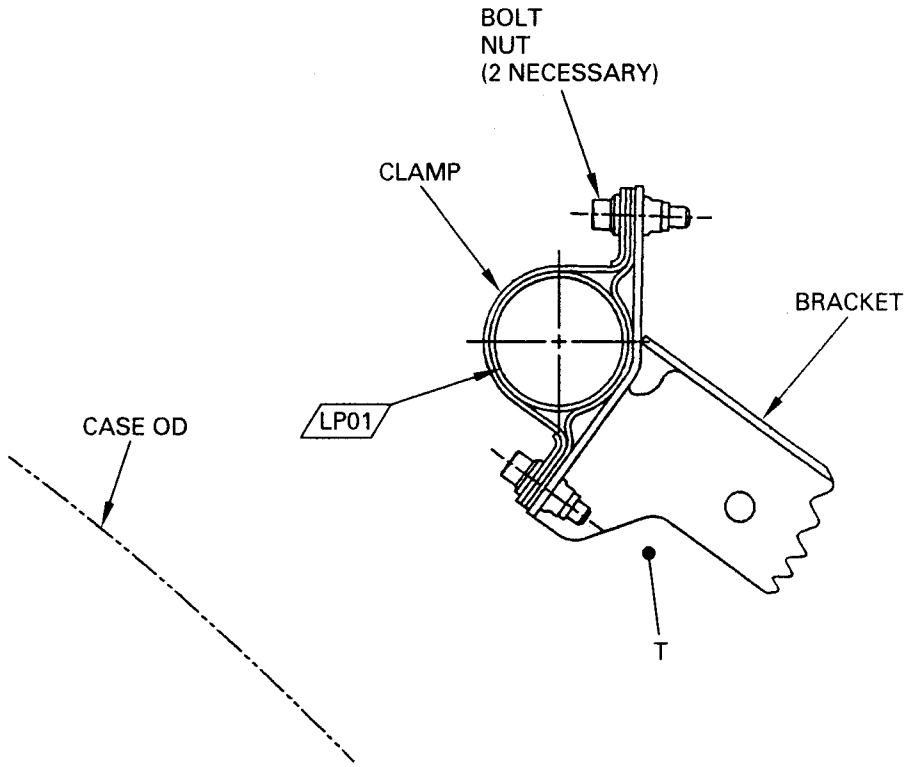


VIEW A-A

BM5 72 00 00 2 KCMG 00

L-B2509 (0000)

Main Oil Filter Tube Assembly
(Post SB PW4ENG 79-75) (Sheet 7/11)
Figure 202

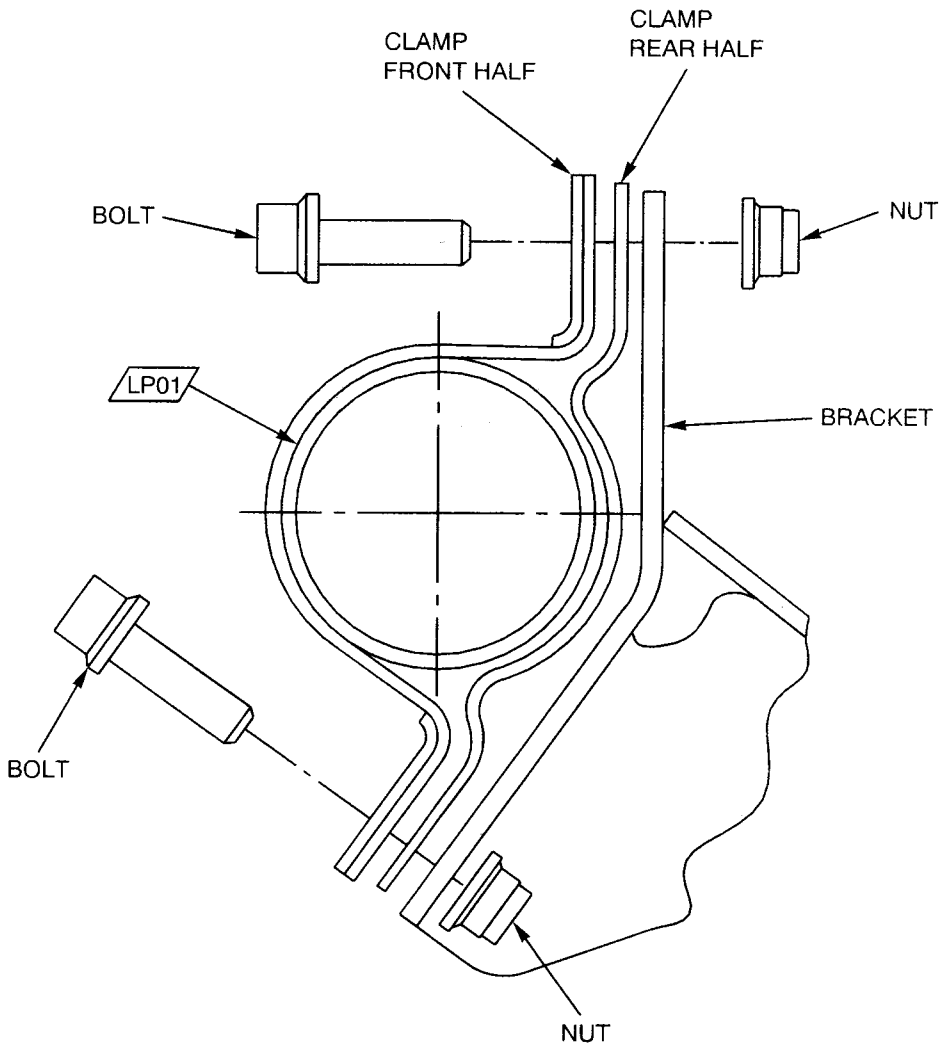


VIEW J-J

L-B2512 (0000)

BM5 72 00 00 2 KCMH 00

Main Oil Filter Tube Assembly
(Post SB PW4ENG 79-75) (Sheet 8/11)
Figure 202

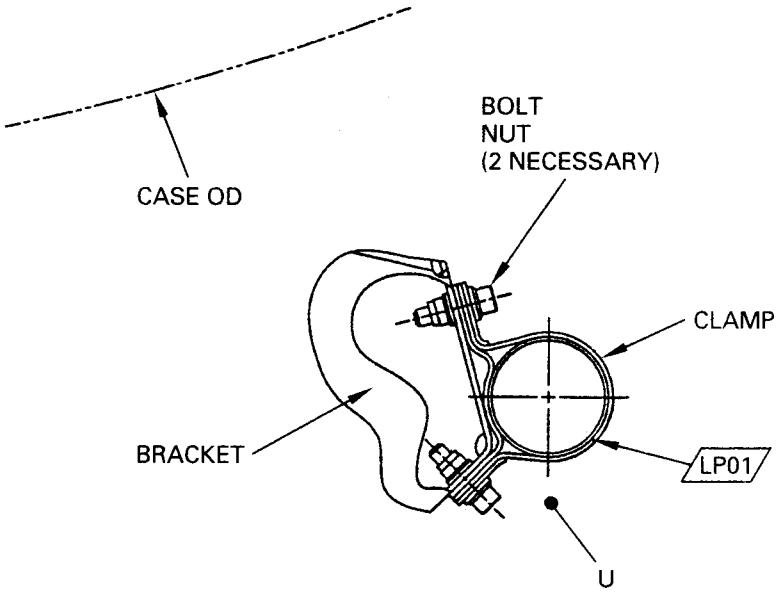


VIEW T

BM5 72 00 00 2 KCMJ 00

L-B2513 (0000)
PW V

Main Oil Filter Tube Assembly
(Post SB PW4ENG 79-75) (Sheet 9/11)
Figure 202

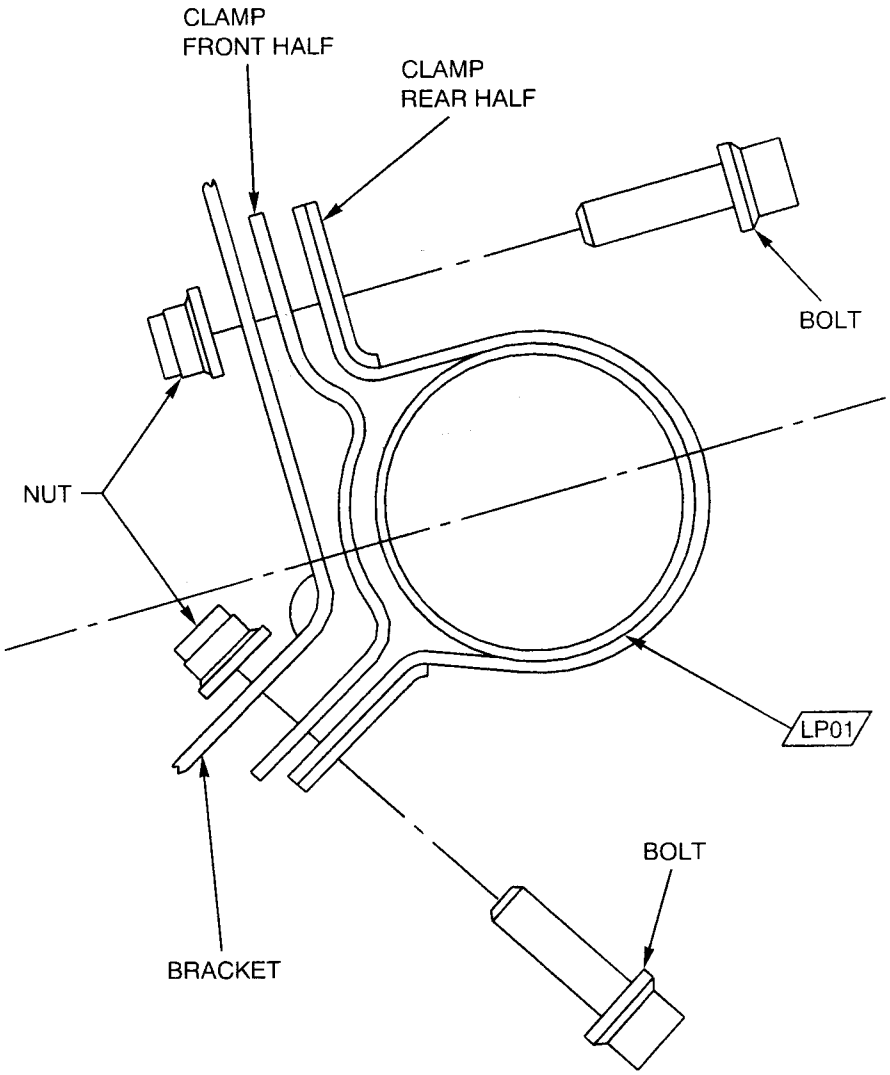


VIEW AE
(ROTATED)

L-B2514 (0000)

BM5 72 00 00 2 KCMK 00

Main Oil Filter Tube Assembly
(Post SB PW4ENG 79-75) (Sheet 10/11)
Figure 202

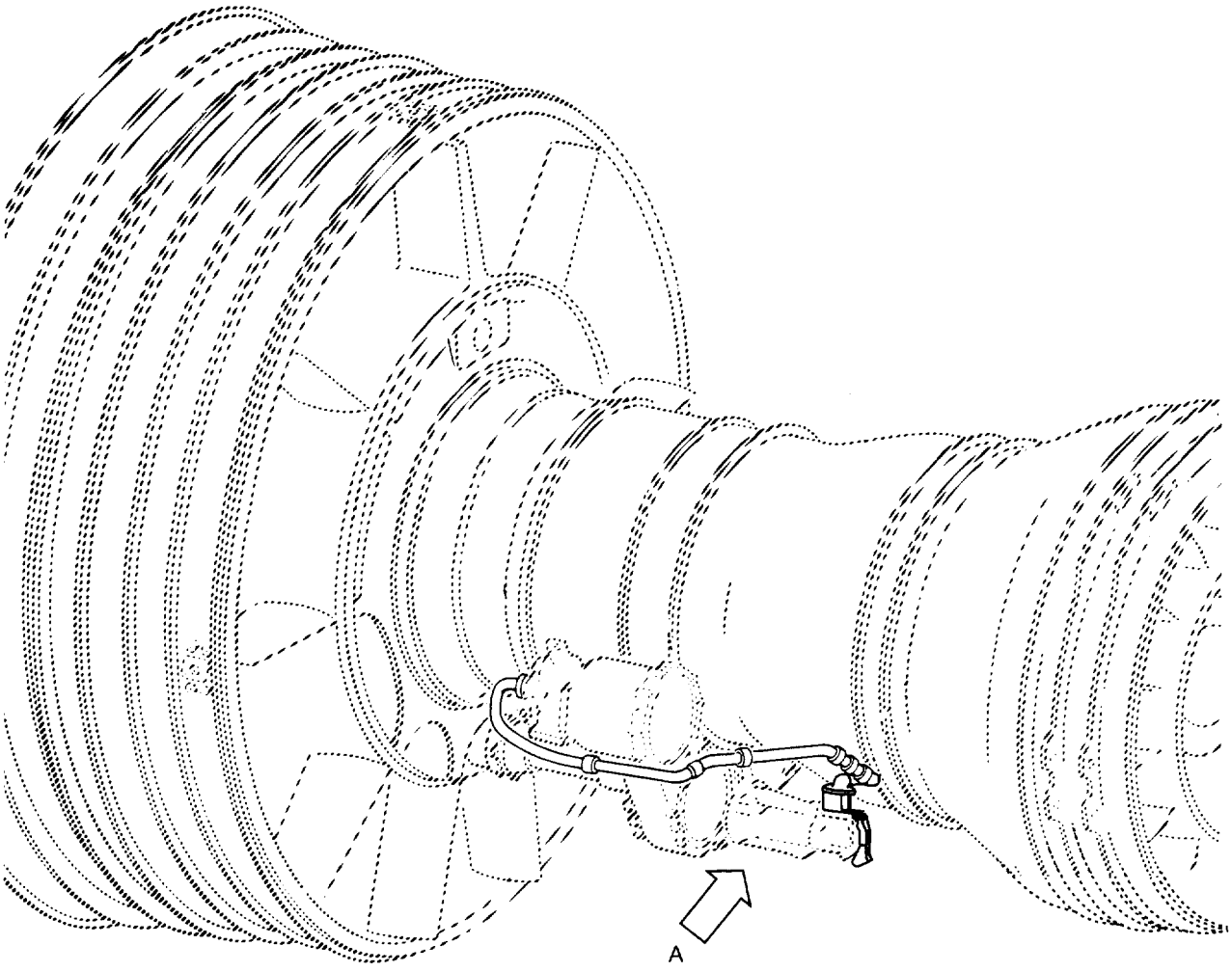


VIEW U

BM5 72 00 00 2 KCML 00

L-B2515 (0000)
PW V

Main Oil Filter Tube Assembly
(Post SB PW4ENG 79-75) (Sheet 11/11)
Figure 202

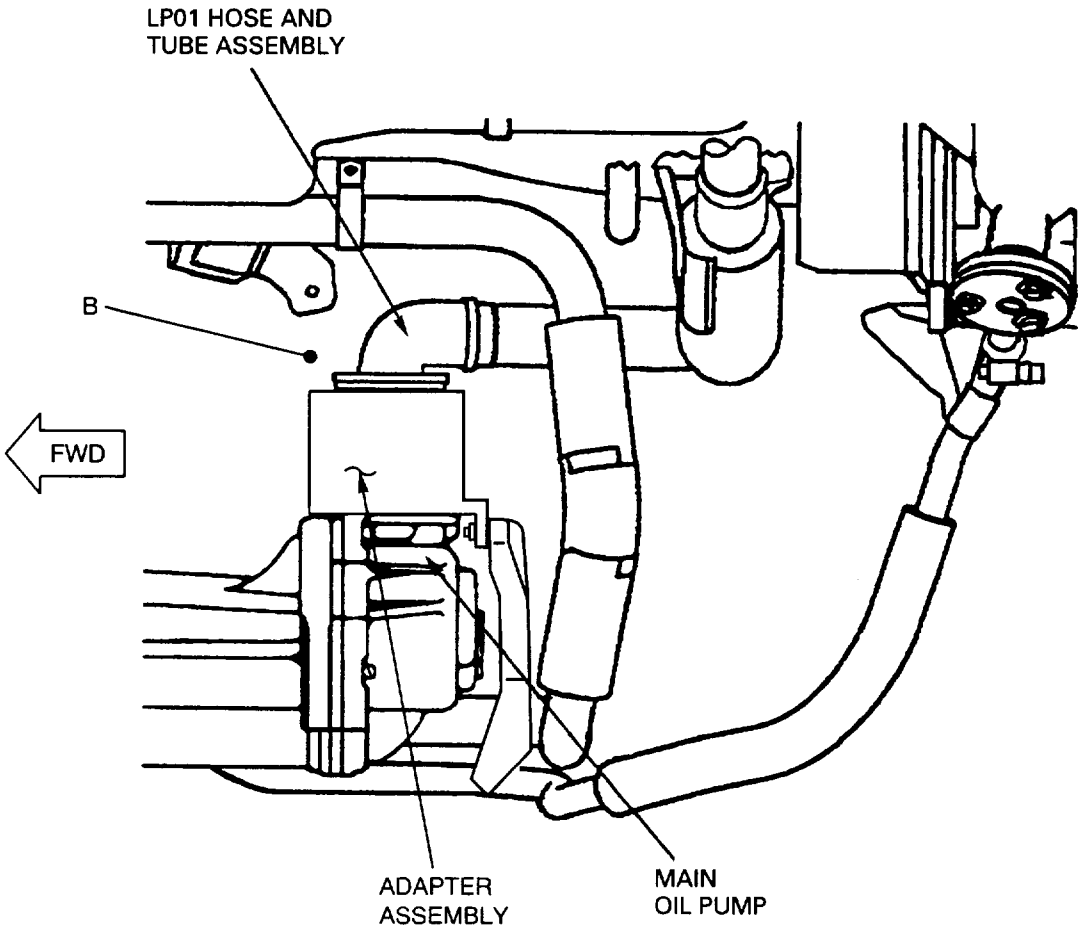


ENGINE LEFT SIDE VIEW

BM5 72 00 00 2 KDMA 00

L-B6567 (0698)

Main Oil Filter Tube Assembly
(Post SB PW4ENG 79-86) (Sheet 1/3)
Figure 203

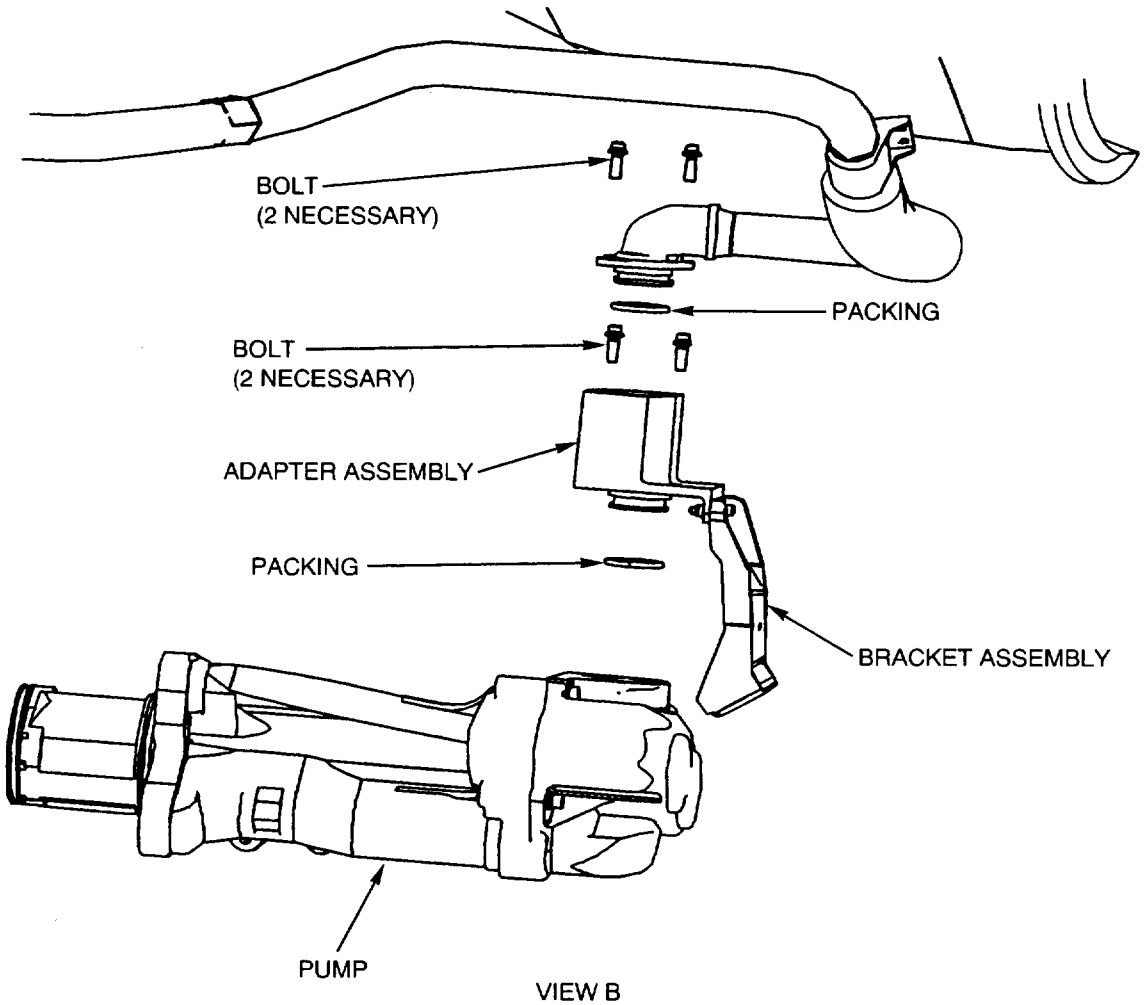


VIEW A

BM5 72 00 00 2 KDMJ 00

L-B6568 (0698)

Main Oil Filter Tube Assembly
(Post SB PW4ENG 79-86) (Sheet 2/3)
Figure 203



L-B6569 (0698)

BM5 72 00 00 2 KDMS 00

Main Oil Filter Tube Assembly
(Post SB PW4ENG 79-86) (Sheet 3/3)
Figure 203

(f)Terminate motoring of engine.

CAUTION : USE CARE WHEN HANDLING FITTINGS AND LINES AFTER MOTORING TO PREVENT INJURY FROM HOT OIL IN SYSTEMS.

(g)Disconnect inlet and outlet lines and remove adapters from main oil filter housing and from top rear of oil pump housing.

(h)(Pre SB PW4ENG 79-75) Install main filter oil tube assembly (LP01) to engine as follows (Ref. Fig. 201) :

1 Install new packings lubricated with Engine Oil (Material No.P03-001), to grooves on both ends of tube.

2 Install tube to port on main oil filter housing and port on top rear of oil pump. Secure tube flange on forward end of tube to filter housing with bolts threads lubricated with Engine Oil (Material No.P03-001).

Secure rear end of tube to pump with bolts threads lubricated with Antigalling Compound (Material No.P06-003).

3 Install clamps to tube as shown in (Ref. Fig. 201).
Secure clamps with bolts threads lubricated with Engine Oil (Material No.P03-001) and nuts. TORQUE bolts to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).

NOTE : Make sure that the (clip-on) loop clamp grommet halves are on the tubes at the correct clamp location (Post SB PW4 ENG 79-36 and post SB PW4 ENG 79-46 only). See the clamp views.

4 TORQUE the bolts that attach the tube to the filter housing to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN). TORQUE the bolts that attach the tube to the oil pump to between 62 and 72 lbf.in. (0.7 and 0.8 m.daN).

(i)(Post SB PW4ENG 79-75) Install the main oil filter hose and tube assembly (LP01) and, if applicable, the fluid pressure dampener or (Post SB PW4ENG 79-86) adapter as follows (Ref. Fig. 202, 203) :

1 If applicable, remove protective closures and install packing lubricated with Engine Oil (Material No.P03-001), to packing groove on the dampener or adapter.

2 If applicable, install the dampener or adapter to the top of the main oil pump and hold with bolts, threads lubricated with Engine Oil (Material No.P03-003), to a handtight condition only.

3 If applicable, install the loop clamp bracket assembly to the dampener or adapter. Use two retainer bolts and nuts to hold the bracket. TORQUE the bolts to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN). (Ref. Fig. 202) (Sheets 5 and 6).

4 Remove protective closures and install packing lubricated with Engine Oil (Material No.P03-003), to packing groove at each end of oil tube assembly (LP01).

5 Install one end of tube (LP01) to the forward side of the main oil filter housing with bolts, threads lubricated with Engine Oil (Material No.P03-003), handtight only.

6 Install the other end of tube (LP01) to the dampener or adapter, threads lubricated with Engine Oil (Material No.P03-003), to a handtight condition only.

7 Install bolts, threads lubricated with Engine Oil (Material No.P03-003), nuts and clamps securing tube to gearbox brackets,

handtight only.

8 Install bolts, threads lubricated with Engine Oil (Material No.P03-003), on the tube (LP01) attaches to the diffuser case bracket.

9 TORQUE all the clamp bolts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

10 If necessary, TORQUE the bolts that hold the dampener or adapter to top of the main oil pump to between 62 and 72 lbf.in. (0.71 and 0.81 m.daN).

11 TORQUE the bolts securing the tube (LP01) to the main oil filter housing to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).

12 TORQUE the bolts that hold the tube (LP01) to the dampener or adapter to between 62 and 72 lbf.in. (0.71 and 0.81 m.daN).

13 TORQUE the bolts securing the tube (LP01) to the diffuser case bracket to between 65 and 75 lbf.in. (0.74 and 0.84 m.daN).

(j) Install all caps, plugs and closures on connecting lines and hydraulic system of cart.

(k) Prepare engine for installation or storage as applicable.

NOTE : For optimum results, two motoring periods may be run with initial charge, after repeating heating cycle. If oil used in flushing process is to be stored in cart, it is recommanded that a heating cycle be run prior to storage to eliminate any condensation and that periodic samples of oil be taken to ensure that no degradation of oil occurs.

2. Clean Last Chance Oil Pressure Strainers

A. Equipment and Materials

ITEM	DESIGNATION
A. Material No.P05-126	Special Materials (Ref. 70-00-00)
B. Material No.P11-004	Cleaning Agents (Ref. 70-00-00)
C.	Container 50 Gallons (200 l)
Referenced Procedure - 79-21-10, P. Block 401	Strainer Elements - Last Chance

B. Job Set-up

(1) Remove No. 1, 1.5, and 2 bearing oil pressure strainer (Ref. 79-21-10, P. Block 401).

(2) Remove angle and main gearbox oil strainer (Ref. 79-21-10, P. Block 401).

(3) Remove No. 3 bearing oil pressure strainer (Ref. 79-21-10, P. Block 401).

(4) Remove No. 4 bearing oil pressure strainer (Ref. 79-21-10, P. Block 401).

C. Procedure (Ref. Fig. 204)

(1) Check for metal particle contamination by brushing strainer elements with Material No.P05-126 or equivalent and Material No.P11-004. Collect cleaning solvent in suitable container and filter through paint strainer or equivalent for metal particle indications.

NOTE : Strainer elements may be degreased in vapor or solvent if such facilities are available.

(2) Ensure strainer elements are clean and free of any foreign material.

(3)Dry strainer elements with dry, filtered compressed air.

D. Close-up
(1)Install No. 4 bearing oil pressure strainer (Ref. 79-21-10, P. Block 401).
(2)Install No. 3 bearing oil pressure strainer (Ref. 79-21-10, P. Block 401).
(3)Install angle and main gearbox oil strainer (Ref. 79-21-10, P. Block 401).
(4)Install No. 1, 1.5, and 2 bearing oil pressure strainer (Ref. 79-21-10, P. Block 401).

3. Repairs for Leakage of Conical Seat of Tube Fittings

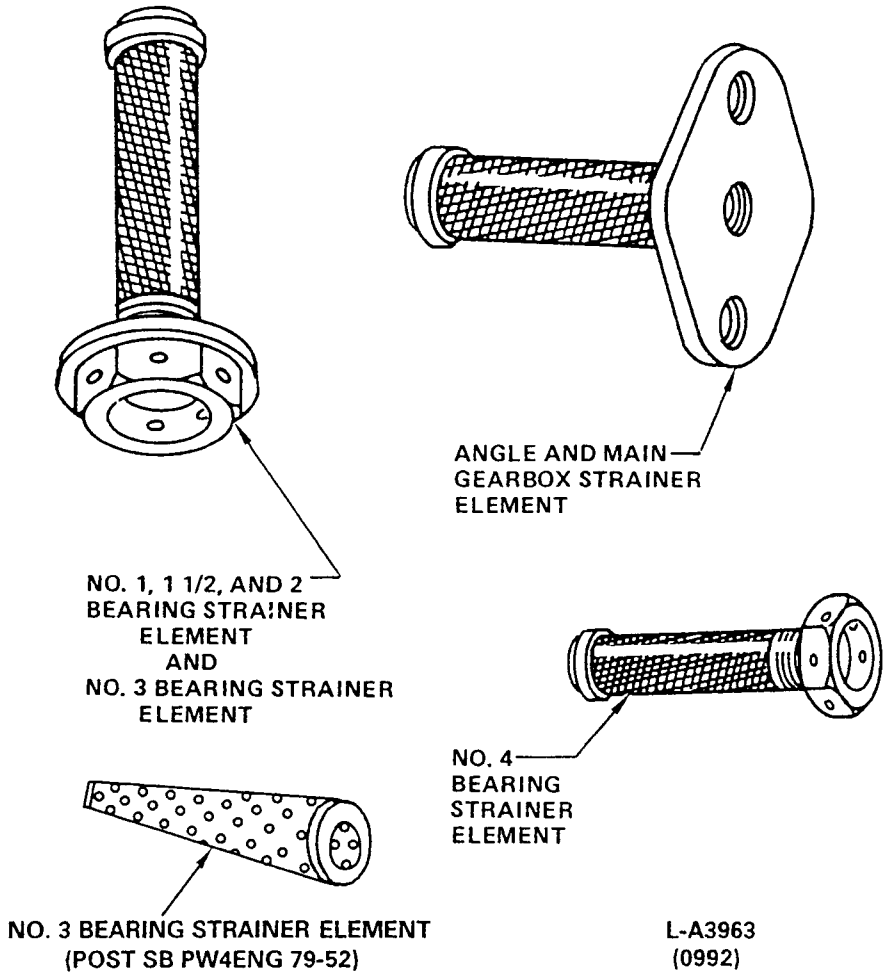
A. Equipment and Materials

ITEM	DESIGNATION
L.	Torque Wrench

B. Procedure
NOTE : This repair is to correct leakage of conical seats on tube fittings that have small nicks and scratches on the sealing surfaces.
(1)Loosen the tube nut and disconnect the tube.
(2)Make clean (wipe) the conical seat mating surfaces.
(3)Put the correct part number voi-shan seal on the male conical seat (Ref. Fig. 205, 206).
(4)With the voi-shan seal installed, connect the tubes.
(5)TORQUE the tube nut to the correct torque for the tube size (Ref. Fig. 205, 206).

4. Fan Rotor Unshinglishing (Can Also Be Used For a Locked Rotor)

A. Definitions
(1)Fan blade lock-up
(a)Lock-up is the sticking of the contact faces of the mid-span shrouds when the friction is high enough to prevent sliding. The mid-span shroud contact faces are designed to slide as the blades twist slightly during normal operation. High friction between the mid-span contact faces can be caused by such conditions as excessive hardface surface roughness/chipping or lack of lubrication.
(b)Symptoms of fan blade lock-up are as follows :
1 A higher than normal N1 engine vibration can be observed.
2 Tightness of the fan blades (observed by the absence of blade looseness at the twelve o'clock position during rotor rotation) can be the cause. Some fan rotors can seem to be locked when there is no looseness at the twelve o'clock position, but unless a resonating sound can be produced, the rotor is not locked.
3 A locked fan rotor is always associated with hearing a resonating sound when a single fan blade is struck with a finger. If a fan rotor is not locked, there will be a dull thud.


ANGLE AND MAIN GEARBOX STRAINER ELEMENT
NO. 1, 1 1/2, AND 2 BEARING STRAINER ELEMENT AND NO. 3 BEARING STRAINER ELEMENT
NO. 4 BEARING STRAINER ELEMENT
NO. 3 BEARING STRAINER ELEMENT (POST SB PW4ENG 79-52)
L-A3963
(0992)

BM5 72 00 00 2 KEMO - 01

Strainer Elements
Figure 204

(2)Fan blade shingling
(a)Fan blades shingle when the mid-span shrouds overlap. Shingling results when the fan blades have been forced to flex in such a manner that causes adjacent blades to bend in a circumferential direction. At the maximum amount of blade bending, the shroud of one blade overlaps the shroud of the mating blade. When the blades return to their neutral position the shrouds are shingled. Usually this happens to blades in the area of contact with an ingested soft-bodied object.
(b)Shingling can be detected if the mid-span shrouds are visually inspected. Blades not involved in the ingestion event will appear normal. Shingling will always produce scuffs or scratches on the inboard or outboard sides of the mid-span shrouds, and will often chip the edges of the hardface on the contact surfaces.
(c)Experience shows that fan blades do not shingle during normal operation. However, fan blade shingling has occurred during an ingestion event such as a bird, large amounts of snow or slush or other large soft-bodied objects. Regular inspection for this condition is not required.

WARNING : EAR PROTECTION MUST BE WORN WHEN YOU DO THIS PROCEDURE. A LOUD BANG-TYPE NOISE WILL BE HEARD WHEN THE BLADES FREE THEMSELVES. THIS COULD CAUSE EAR DAMAGE.

B. Procedure
(1)Unshingle a fan rotor or free a locked rotor as follows :
(a)Select a wooden pry bar of sufficient length and strength to apply a heavy force between the fan blades. A piece of soft wood approximately 2 x 3.5 in. (50.80 x 88.90 mm) in cross section by approximately 6 ft. (1.83 m) in length is recommended.
(b)Insert the wooden pry bar near the mid-span shrouds between the shingled fan blades. Be careful to place the wooden pry bar flat against the blade leading and trailing edges and not set an angle to these surfaces. Placing the wooden pry bar in this manner will prevent bending damage. For a locked rotor, the pry bar should be inserted near the mid-span shrouds at any blade location.
(c)Give the pry bar a quick pull to free the blades. A loud noise will be heard when the blades unshingle or unlock.
NOTE : Use care not to damage the leading edge or trailing edge of the blades when unshingling a shingled rotor or unlocking a locked rotor.
(d)If the first attempt is not successful, move the pry bar to improve leverage and do step (c) again.
NOTE : If this procedure is used to unlock a locked rotor, lubrication of the mid-span shrouds is recommended per MAN-PW4000-1-92.
(e)Make a visual inspection of the mid-span shrouds and the leading and trailing edges of the shingled blades for damage. Closely compare the position of the mid-span shrouds, and the airfoil leading and trailing edge shape to blades that were not shingled.
(f)Make a visual inspection of the mid-span shroud contact edges and contact hardface surfaces for scrape marks and hardface chipping.

C. Shingled Blade Limits
(1)Replace blades prior to next flight that show any mid-span shroud

position change.

(2) Replace blades prior to next flight where airfoil leading or trailing edge damage or deformation is beyond acceptable limits. If no airfoil leading or trailing edge deformation/damage is visible, replace the affected fan blades within 25 cycles.

(3) Blades with mid-span shroud contact edge marks and/or shroud contact hardface surface damage can continue in service for 6 cycles. After 6 cycles, the affected blades must be removed for close-up inspection of the hardface. NDI of the mid-span shrouds is not required.

HOSE SIZE	TUBING OD	THREAD SIZE	SEAL PN (SEAL MATERIAL)*	TORQUE (LB-IN.)		
				STEEL FITTING**		TI FITTING
				OIL LUBRICATED	ANTI-SEIZE COATED **	ANTI-SEIZE COATED ***
-3	0.1875	0.375-24	VSF1015C-3 VSF1015N-3	50 - 60	40 - 45	50 - 60
-4	0.250	0.4375-20	VSF1015C-4 VSF1015N-4	90 - 100	65 - 75	90 - 100
-5	0.3125	0.500-20	VSF1015C-5 VSF1015N-5	135 - 150	100 - 110	120 - 135
-6	0.375	0.5625-18	VSF1015C-6 VSF1015N-6	200 - 220	150 - 165	135 - 150
	0.4375	0.625-18	VSF1015C-7 VSF1015N-7	250 - 270	185 - 200	250 - 270
-8	0.500	0.750-16	VSF1015C-8 VSF1015N-8	350 - 400	270 - 300	350 - 400
	0.562	0.8125-16	VSF1015C-9 VSF1015N-9	400 - 450	300 - 350	400 - 450
-10	0.625	0.875-14	VSF1015C-10 VSF1015N-10	500 - 550	360 - 400	500 - 550
	0.656	0.9375-12	VSF1015C-10.5 VSF1015N-10.5	550 - 600	420 - 460	550 - 600
	0.688	1.000-12	VSF1015C-11 VSF1015N-11	600 - 700	480 - 530	600 - 700
-12	0.750	1.0625-12	VSF1015C-12 VSF1015N-12	700 - 800	540 - 600	700 - 800
	0.875	1.1875-12	VSF1015C-14 VSF1015N-14	800 - 900	600 - 675	800 - 900
-16	1.000	1.3125-12	VSF1015C-14 VSF1015N-14	1000 - 1100	750 - 825	1000 - 1100
	1.125	1.500-12	VSF1015C-18 VSF1015N-18	1300 - 1400	900 - 1000	1300 - 1400
-20	1.250	1.625-12	VSF1015C-20 VSF1015N-20	1400 - 1500	1000 - 1100	1400 - 1500
-24	1.500	1.875-12	VSF1015C-24 VSF1015N-24	1600 - 1700	1200 - 1300	1600 - 1700

* Letter "C" in part number denotes copper seal.
Letter "N" in part number denotes nickel seal.

** For mixed material assembly (steel connector with titanium nut or titanium connector with steel nut) use titanium torque.

*** Spec PWA 550 and Spec PWA 586

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Torque Values (lbf.in.) - Part Numbers for 37 Degrees Cone Seat Connectors with Nickel Gaskets - Table 201
Figure 205

HOSE SIZE	TUBING OD	THREAD SIZE	SEAL PN (SEAL MATERIAL)*	TORQUE (N.m)* STEEL FITTING** OIL LUBRICATED	STEEL FITTING** ANTI-SEIZE COATED **	TI FITTING ANTI SEIZE COATED ***
-3	0.1875	0.375-24	VSF1015C-3 VSF1015N-3	(5.649 - 6.779)	(4.519 - 5.084)	(5.649 - 6.779)
-4	0.250	0.4375-20	VSF1015C-4 VSF1015N-4	(10.169 - 11.298)	(7.344 - 8.474)	(10.169 - 11.298)
-5	0.3125	0.500-20	VSF1015C-5 VSF1015N-5	(15.253 - 16.948)	(11.298 - 12.428)	(13.558 - 15.253)
-6	0.375	0.5625-18	VSF1015C-6 VSF1015N-6	(22.597 - 24.857)	(16.948 - 18.642)	(15.253 - 16.948)
	0.4375	0.625-18	VSF1015C-7 VSF1015N-7	(28.246 - 30 506)	(20.902 - 22.597)	(28.246 - 30.506)
-8	0.500	0.750-16	VSF1015C-8 VSF1015N-8	(39.545 - 45.194)	(30.506 - 33.895)	(39.545 - 45.194)
	0.562	0.8125-16	VSF1015C-9 VSF1015N-9	(45.194 - 50.843)	(33.895 - 39.545)	(45.194 - 50.843)
-10	0.625	0.875-14	VSF1015C-10 VSF1015N-10	(56.492 - 62.142)	(40.675 - 45.194)	(56.492 - 62.142)
	0.656	0.9375-12	VSF1015C-10.5 VSF1015N-10.5	(62.142 - 67.791)	(47.454 - 51.973)	(62.142 - 67.791)
	0.688	1.000-12	VSF1015C-11 VSF1015N-11	(67.791 - 79.089)	(54.233 - 59.882)	(67.791 - 79.089)
	0.750	1.0625-12	VSF1015C-12 VSF1015N-12	(79.089 - 90.388)	(61.012 - 67.791)	(79.089 - 90.388)
	0.875	1.1875-12	VSF1015C-14 VSF1015N-14	(90.388 - 101.686)	(67.791 - 76.265)	(90.388 - 101.686)
-16	1.000	1.3125-12	VSF1015C-14 VSF1015N-14	(112.985 - 124.283)	(84.739 - 93.212)	(112.985 - 124.283)
	1.125	1.500-12	VSF1015C-18 VSF1015N-18	(146.880 - 158.179)	(101.686 - 112.985)	(146.880 - 158.179)
-20	1.250	1.625-12	VSF1015C-20 VSF1015N-20	(158.179 - 169.477)	(112.985 - 124.283)	(158.179 - 169.477)
-24	1.500	1.875-12	VSF1015C-24 VSF1015N-24	(180.776 - 192.074)	(135.582 - 146.880)	(180.776 - 192.074)

* Letter "C" in part number denotes copper seal.
Letter "N" in part number denotes nickel seal.

** For mixed material assembly (steel connector with titanium nut or titanium connector with steel nut) use titanium torque.

*** Spec PWA 550 and Spec PWA 586

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BM5 72 00 00 2 KJMO - 01

Torque Values (N.m) - Part Numbers for 37 Degrees Cone Seat Connectors with Nickel Gaskets - Table 202
Figure 206

1. Accomplish Engine Preservation for 60 Days or Less (Method I)

A. General
(1)This task gives instructions to preserve the engine for 60 days or less (Method I).

B. Preserve the Engine Oil System for 60 Days or Less (Method I)
(1)For instructions for Preservation of the Oil System for 60 Days or Less (Method I) refer to General Instructions for the Preservation of Engines for Storage (SPOP 428) and Preservation of the Engine for 60 Days or Less (Method I) (SPOP 428) (Ref. 70-00-00, P. Block 201).

2. Preservation of the Engine for More Than 60 Days (Method II)

A. General
(1)Preservation of the engine for than 60 days, Method (II).
(2)For instructions for Preservation of the Oil System for More Than 60 Days (Method II) refer to General Instructions for the Preservation of Engines for Storage (SPOP 428) (Ref. 70-00-00, P. Block 201).

B. Equipment and Materials

ITEM	DESIGNATION
(1)CTE 3160	Cart, Preservation or Equivalent
(2)PWA85433	Adapter
(3)PWA85451	Adapter
(4)Material No.P03-001	Oils (Ref. 70-00-00)
(5)Material No.P03-002	Oils (Ref. 70-00-00)
(6)Material No.P06-002	Lubricants (Ref. 70-00-00)
R (7)	Packings
Referenced Procedures	
- 12-13-79, P. Block 001	Engine Oil System
- 70-00-00, P. Block 201	Standard Practices - Engine
- 71-00-00, P. Block 201	Power Plant - General
- 73-12-03, P. Block 401	Filter - Fuel
- 79-21-03, P. Block 401	Filter - Oil
- 79-22-03, P. Block 401	Magnetic Plug
- 80-13-01, P. Block 401	Pneumatic Starter Assembly

C. Engine Oil System Preservation
(1)Drain the engine oil as follows :
(a)Remove the magnetic chip collector assemblies and valve assemblies from the main gearbox and the oil tank. (Ref. 79-22-03, P. Block 401). Let the oil drain into containers.
(b)Remove the main oil filter. (Ref. 79-21-03, P. Block 401). Let the oil drain into containers for approximately one-half hour.
(c)Install a new oil filter. (Ref. 79-21-03, P. Block 401).
(d)Install the magnetic chip collector assemblies and valve assemblies.

(Ref. 79-22-03, P. Block 401).
(2)Fill and service the oil tank. (Ref. 12-13-79, P. Block 1).
(3)Ground run the engine, (optional to motor procedure).
(a)Start the engine. (Ref. 71-00-00, P. Block 201). Engine Starting, Procedure (Normal). Set minimum idle and hold for five minutes.
(b)Set power at 1.13 to 1.14 EPR and hold for five minutes after main oil
R temperature has reached 220°F (104°C) or more. Continue to operate the engine for five minutes.
(c)Decrease power setting to minimum idle and hold for five more minutes.
(d)Do an engine shutdown by the Normal Engine Shutdown Procedure. (Ref. 71-00-00, P. Block 201).
(e)For engines that can not be started and operated, motor the engine with the starter at a starter inlet air pressure of 15 psi (103.4 kPa) minimum. Make sure that the fan (LPC) is turning during motoring. If necessary increase the starter inlet air pressure to turn the fan (LPC). The maximum starter inlet air pressure is 50 psi (344.7 kPa). Continue to motor the engine for five minutes. This will flow the oil through the engine. Be sure not to run more than the starter operation time limits.
(f)Do not drain the engine oil after you preserve the fuel system.
(4)Air motor the engine, (optional to engine operation).
NOTE : This alternate method to motor the engine can be used when a test cell is not available to test the engine.
CAUTION : MAKE SURE THAT THE ENGINE IS CORRECTLY INSTALLED IN THE DOLLY STAND AND THE WHEELS OF THE STAND ARE LOCKED.
(a)Air motor the engine, (optional to engine operation) refer to Preservation of Engines For Storage For More Than 60 Days (Method II) (SPOP 428) (Ref. 70-00-00, P. Block 201).

D. Fuel System Preservation - Pressure Feed Method to Preserve the Engine Fuel System (For Engines That Will Be Inactive for Over 60 Days) (Optional to Gravity Feed Method)
(1)Close the LP fuel shutoff valve as follows :
(a)Make certain that circuit breakers 1WE, 3WE, 5WE, 7WE are open, safety clipped, and tagged.
(b)Make certain that circuit breakers 3QG, 4QG, 1QG, 2QG, 5QG, and 6QG are closed.
(c)Energize the aircraft electrical network and make certain that the electronic racks are ventilated (Ref. 24-41-00, P. Block 301).
(d)On panel 20VU, pull ENG1 (ENG2) FIRE handle.
(2)Drain the fuel system as follows :
(a)Remove the lockwire and drain plugs for the FP1 and FP3 ports of the fuel pump. Let the fuel drain into a 5 U.S. gallon (19 liters) fluid drain container (Ref. Fig. 301, 302).
(3)If installed, disconnect the main fuel supply line as follows :
(a)Remove the four bolts and washers that attach the line to the pump (Ref. Fig. 301).
(b)Disengage the line and remove the gasket.
(4)Remove the fuel pump filter. (Ref. 73-12-03, P. Block 401).
(5)Install the new fuel pump filter. (Ref. 73-12-03, P. Block 401).
(6)Install the PWA85451 Adapter to the fuel flowmeter as follows :

(a)Remove the lockwire and eight bolts that attach the rear fuel flowmeter support. Remove the support (Ref. Fig. 303, 304).
(b)Move the transfer tube rearward into the fuel distribution valve strainer cover. Remove the four bolts and washers that attach the cover to the valve. Remove the cover and transfer tube together as a unit.
(c)Install the PWA85451 Adapter with the packing removed from the transfer tube and the three bolts to the fuel flowmeter outlet. Tighten bolts (Ref. Fig. 305).
(d)Attacth a hose to the adapter. Put the other end in a container with a minimum capacity of 5 U.S. gallons (19 liters).

(7)Install the PWA85433 Adapter with the gasket removed from the main fuel line and the four bolts to the fuel pump inlet. Tighten bolts (Ref. Fig. 306).
(8)Install the two drain plugs with new packings, lubricated with White Petrolatum (Material No.P06-002). TORQUE the plugs to between 45 and 55 lbf.in. (0.51 and 0.62 m.daN) and wirelock.

CAUTION : BE SURE THE PRESERVATION CART HAS FILTERS OR STRAINERS OF NO COARSER MESH THAN USED IN THE ENGINE FUEL SYSTEM.

CAUTION : DO NOT SPRAY PRESERVATION OIL (MATERIAL NO.P03-002) INTO THE ENGINE GASPATH. THE OIL CAN CAUSE UNWANTED MATERIAL TO STICK TO THE BLADES AND VANES. REDUCED ENGINE PERFORMANCE CAN RESULT.

CAUTION : MAKE SURE THE ENGINE OIL SYSTEM HAS THE CORRECT AMOUNT OF OIL IN THE SYSTEM OR DAMAGE TO THE ENGINE CAN OCCUR.

(9)Attach the fuel accessory preservation cart assembly (CTE 3160 or equivalent) pressure hose to the PWA85433 adapter on the fuel pump inlet port.
(10)Make sure the preservation cart is away from the engine inlet, exhaust and fan discharge area(s).
(11)Put the HP fuel shutoff valve control lever to the ON position.
(12)Use the cart and flush lubricating oil (Material No.P03-002), at a pressure of 5 to 25 psi (34.5 to 172.4 kPa) and at 60°F (16°C) minimum and wet motor the engine (Ref. 71-00-00, P. Block 501, Engine Test No. 2) until approximately 2 U.S. gallons (8 liters) is discharged into the fluid drain container.

NOTE : Do not operate the aircraft fuel pumps to perform this wet motoring.

(13)Stop the wet motor and the pump on the fuel accessory preservation cart and disconnect the cart and let the system drain.
(14)Remove the adapters and gasket from the rear of the fuel flowmeter and the fuel pump inlet port.
(15)Connect the main fuel supply line as follows :
(a)Install a new gasket and the main fuel supply line flange to the fuel pump port.
(b)Install the four bolts and washers. TORQUE the bolts to between 180 and 220 lbf.in. (2.04 and 2.25 m.daN).

NOTE : If another engine is to be installed, put protective covers on both the fuel pump inlet and the main fuel line.

(16)Install the fuel flowmeter transfer tube and rear support as follows :
(a)Install two new packings lubricated with White Petrolatum (Material No.P06-002), to the transfer tube. Install the transfert tube to the

fuel distribution valve strainer cover.

(b)Install a new packing lubricated with White Petrolatum (Material No.P06-002), to the strainer cover. Install the cover and transfer tube to the fuel distribution valve and attach with the four bolts, lubricated with Engine Oil (Material No.P03-001), and washers. TORQUE the bolt to between 30 and 33 lbf.in. (0.34 and 0.37 m.daN).

(c)Slide the transfer tube forward and engage the fuel flowmeter and dowel pin. Place the support in position and align the brackets. Install the eight bolts, lubricated with Engine Oil (Material No.P03-001).
NOTE : Install the drilled head bolts to the front.

(d)TORQUE the eight bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN). Wirelock the front four bolts.

(e)Open the LP fuel shutoff valve as follows :

1 On panel 20VU, reset ENG1 (ENG2) FIRE handle.

2 Remove safety clips and tags and close circuit breakers 1WE, 3WE, 5WE, 7WE.

(17)Write the date and the method of preservation on a tag and attach it to the fuel metering unit.

E. Fuel System Preservation - Gravity Feed Method to Preserve the Engine Fuel System (For Engines That Will Be Inactive for Over 60 Days) (Optional to Pressure Feed Method)

(1)Close the LP fuel shutoff valve as follows :

(a)Make certain that circuit breakers 1WE, 3WE, 5WE, 7WE are open, safety clipped, and tagged.

(b)Make certain that circuit breakers 3QG, 4QG, 1QG, 2QG, 5QG, and 6QG are closed.

(c)Energize the aircraft electrical network and make certain that the electronic racks are ventilated (Ref. 24-41-00, P. Block 301).

(d)On panel 20VU, pull ENG1 (ENG2) FIRE handle.

(2)Drain the fuel system as follows :

(a)Remove the lockwire and drain plugs for the FP1 and FP3 ports of the fuel pump. Let the fuel drain into a 5 U.S. gallon (19 liters) fluid drain container (Ref. Fig. 301, 302).

(3)If installed, disconnect the main fuel supply line as follows :

(a)Remove the four bolts and washers that attach the line to the pump.

(b)Disengage the line and remove the gasket.

(4)Remove the fuel pump filter. (Ref. 73-12-03, P. Block 401).

(5)Install the new fuel pump filter. (Ref. 73-12-03, P. Block 401).

(6)Install the PWA85451 adapter to the fuel flowmeter as follows :

(a)Remove the lockwire and eight bolts that attach the rear fuel flowmeter support. Remove the support (Ref. Fig. 303, 304).

(b)Move the transfer tube rearward into the fuel distribution valve strainer cover. Remove the four bolts and washers that attach the cover to the valve. Remove the cover and transfer tube together as a unit.

(c)Install the PWA85451 Adapter with the packing removed from the transfer tube and the three bolts to the fuel flowmeter outlet. Tighten bolts (Ref. Fig. 305).

(d)Attach a hose to the Adapter. Put the other end in a container with a minimum capacity of 5 U.S. gallons (19 liters).

(7)Install the PWA85433 adapter with the gasket removed from the main fuel line and the four bolts to the fuel pump inlet. Tighten bolts (Ref. Fig. 306).

(8)Install the two drain plugs with new packings, lubricated with white petrolatum (Material No.P06-002). TORQUE the plugs to between 45 and 55 lbf.in. (0.51 and 0.62 m.daN) and wirelock.

CAUTION : DO NOT SPRAY PRESERVATION OIL (MATERIAL NO.P03-002) INTO THE ENGINE GASPATH. THE OIL CAN CAUSE UNWANTED MATERIAL TO STICK TO THE BLADES AND VANES. REDUCED ENGINE PERFORMANCE CAN RESULT.

CAUTION : MAKE SURE THE ENGINE OIL SYSTEM HAS THE CORRECT AMOUNT OF OIL IN THE SYSTEM OR DAMAGE TO THE ENGINE CAN OCCUR.

(9)Use a clean dry tank with a capacity of 5 to 10 U.S. gallons (19 to 38 liters) and assemble a gravity feed preservation tank as follows :

(a)The tank must be vented and have a fitting at the bottom to attach a valve and hose.

NOTE : The hose must be 0.5 in. (12.70 mm) inner diameter (ID) minimum, approximately 20 feet (6.10 m) in length, and must not collapse under negative pressure.

(b)Install a shutoff valve to the bottom of the tank with an in-line 40 micron filter.

(c)Attach the hose to the PWA85433 adapter on the fuel pump inlet port.

(d)Position the tank away from the engine fan discharge air and 5 feet (1.52 m) minimum above the fuel pump inlet.

(e)Shut the valve at the bottom of the tank.

(f)Fill the tank with 5 U.S. gallons (19 liters) minimum of flushing oil (Material No.P03-002).

(10)Put the HP fuel shutoff valve control lever to the ON position.

(11)Open the valve at the bottom of the tank and wet motor the engine (Ref. 71-00-00, P. Block 501, Engine Test No. 2) until approximately 2 U.S. gallons (8 liters) of flushing oil comes out of the drain adapter and into the fluid drain continair.

(12)Stop the wet motor and close the valve at the bottom of the tank.

(13)Disconnect the hose and let the fuel system drain.

(14)Remove the adapters and gasket from the rear of the fuel flowmeter and the fuel pump inlet port.

(15)Connect the main fuel supply line as follows :

(a)Install a new gasket and the main fuel supply line flange to the fuel pump port.

(b)Install the four bolts and washers. TORQUE the bolts to between 180 and 220 lbf.in. (2.04 and 2.25 m.daN).

NOTE : If another engine is to be installed, put protective covers on both the fuel pump inlet and the main fuel line.

(16)Install the fuel flowmeter transfer tube and rear support as follows :

(a)Install two new packings lubricated with white petrolatum (Material No.P06-002), to the transfer tube.
Install the transfer tube to the fuel distribution valve strainer cover.

(b)Install a new packing lubricated with white petrolatum (Material No.P06-002), to the strainer cover.
Install the cover and transfer tube to the fuel distribution valve and attach with the four bolts, lubricated with engine oil (Material

No.P03-001), and washers. TORQUE the bolt to between 30 and 33 lbf.in. (0.34 and 0.37 m.daN).

(c) Slide the transfer tube forward and engage the fuel flowmeter and dowel pin. Place the support in position and align the brackets. Install the eight bolts, lubricated with engine oil (Material No.P03-001).
NOTE : Install the drilled head bolts to the front.

(d) TORQUE the eight bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN). Install the lockwire to the front four bolts.

(e) Open the LP fuel shutoff valve as follows :
1 On panel 20VU, reset ENG1 (ENG2) FIRE handle.
2 Remove safety clips and tags and close circuit breakers 1WE, 3WE, 5WE, 7WE.

(17) Write the date and the method of preservation on a tag and attach it to the fuel metering unit.

(18) If engine is on wing, use Method II.

F. Do the steps which follow to complete the Preservation of the Engine for More Than 60 Days, (Method II) refer to Preservation of Engines for Storage for More Than 60 Days (Method II) (SPOP 428) (Ref. 70-00-00, P. Block 201).

(1) Preserve the gearbox.
(2) Drain the oil in the engine oil system.
(3) Preserve the engine for relative humidity.
(4) Seal the engine for storage.
(5) Make a record of the engine preservation.
(6) Examine the engine during preservation.

3. Accomplish Engine Depreservation

A. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedures - 70-00-00, P. Block 201	Engine - Standard Practices

B. General

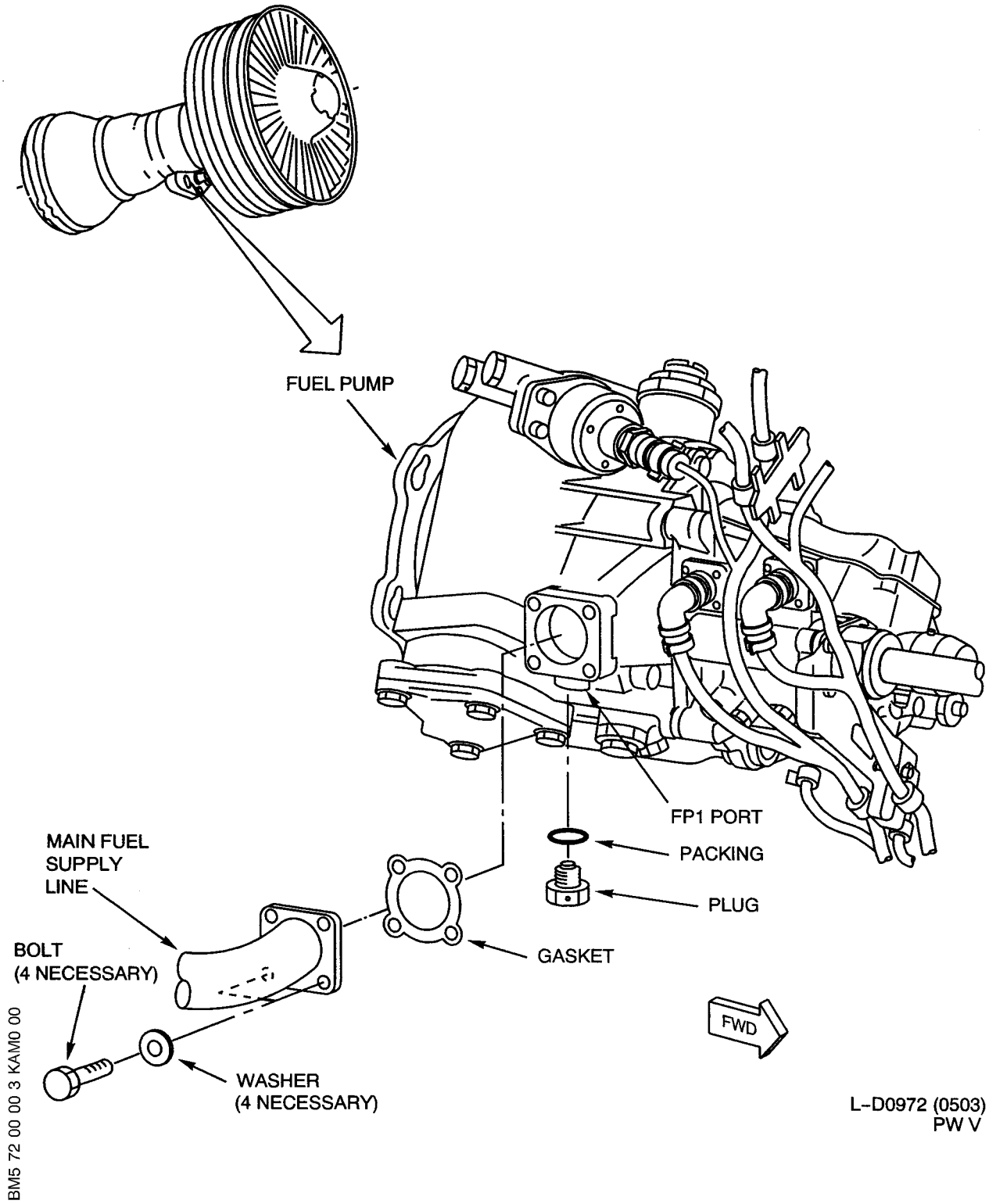
(1) This task gives instructions to put the engine back in to service after preservation.

C. Depreservation Procedures for Engines that Were Preserved for 60 Days or Less (Method I)

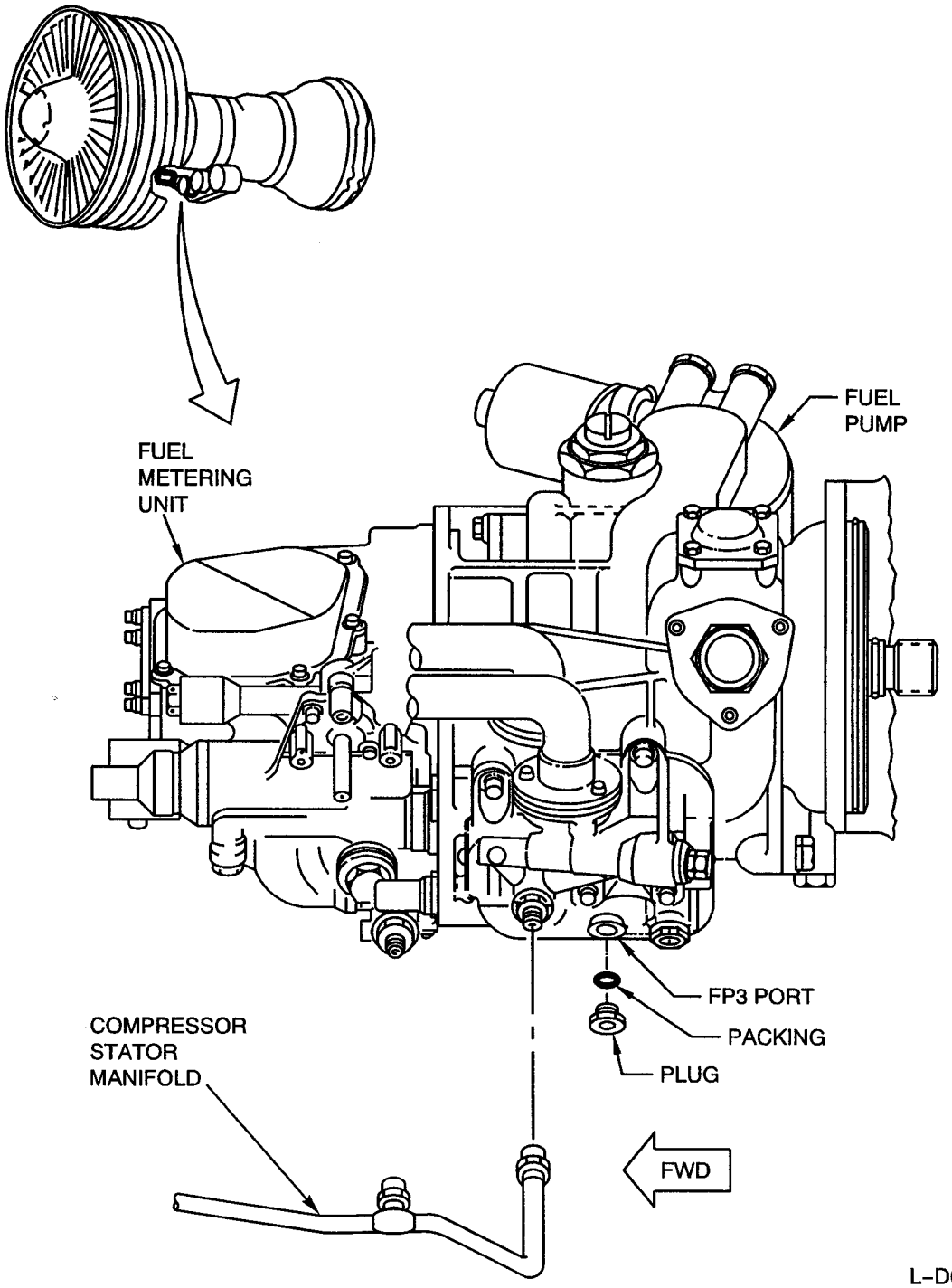
(1) For instructions for De-Preservation of the Oil System for 60 Days or Less (Method I) refer to De-Preservation of the Engine After Storage (SPOP 428) (Ref. 70-00-00, P. Block 201).

D. Depreservation Procedures for Engines that Were Preserved for More Than 60 Days (Method II)

(1) For instructions for De-Preservation of the Oil System for 60 Days or Less (Method II) refer to De-Preservation of the Engine After Storage (SPOP 428) (Ref. 70-00-00, P. Block 201).



Engine Preservation
Figure 301



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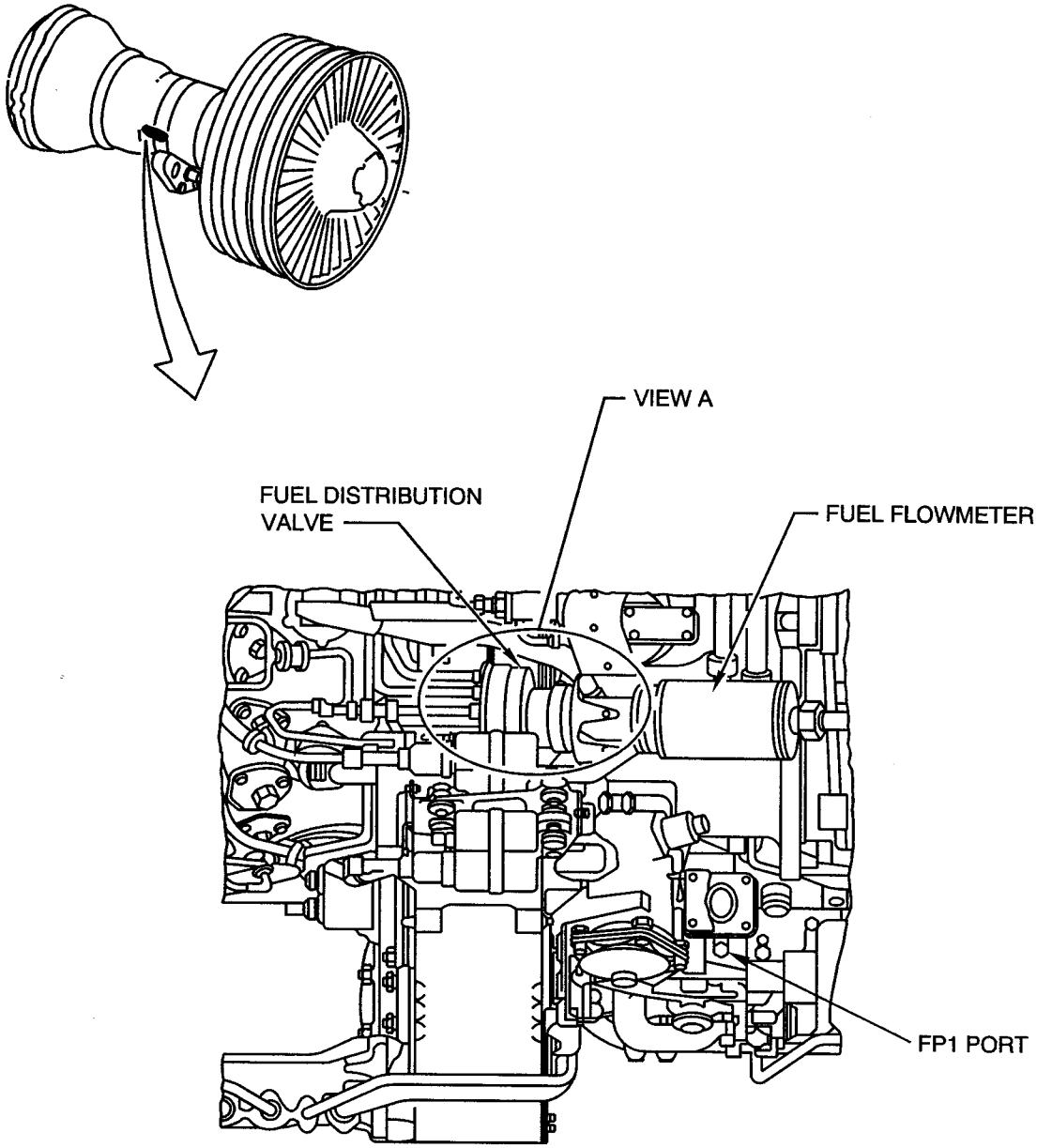
PW V

Engine Preservation
Figure 302



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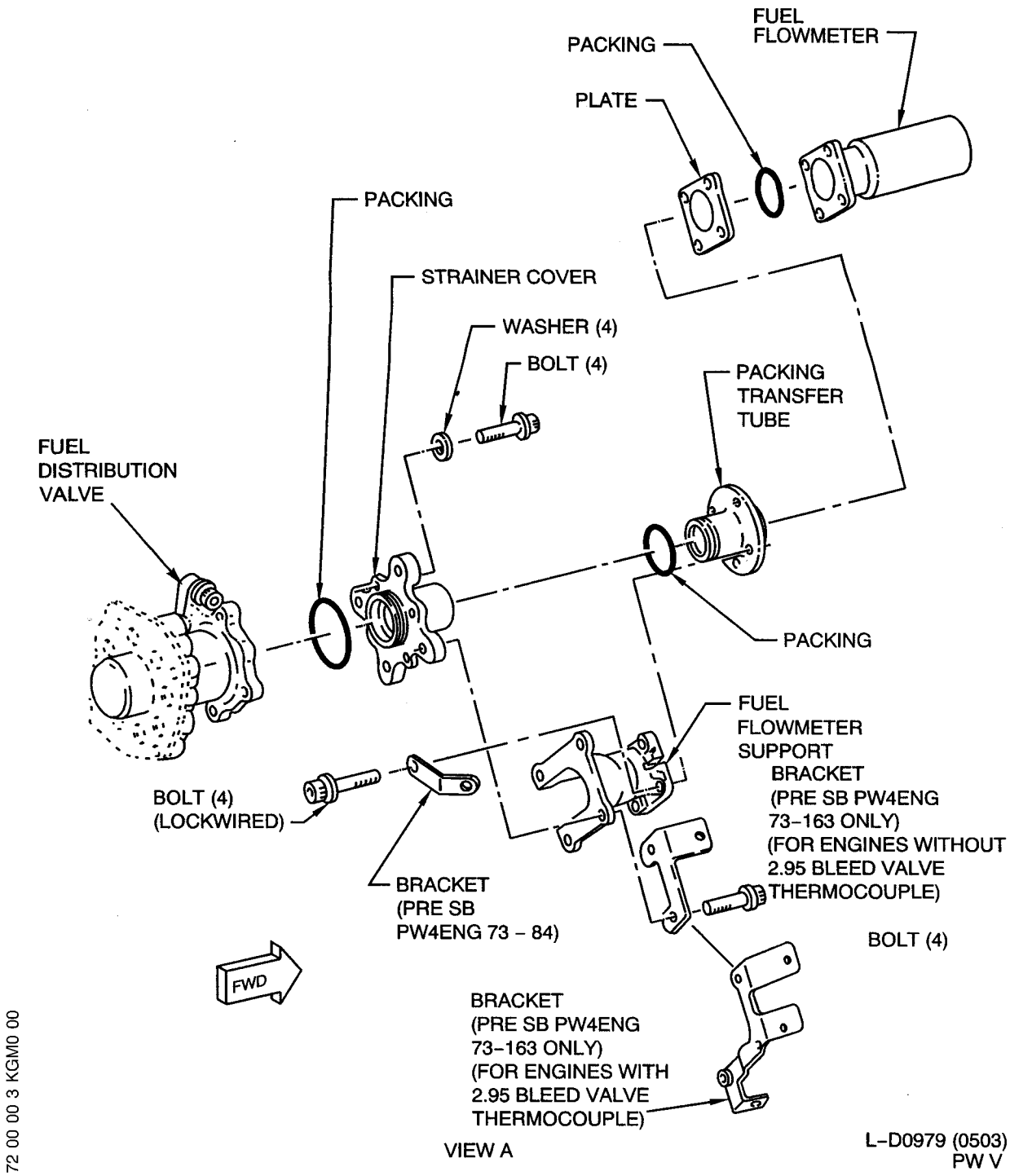
L-D0977 (0503)
PW V

Engine Preservation
Figure 303



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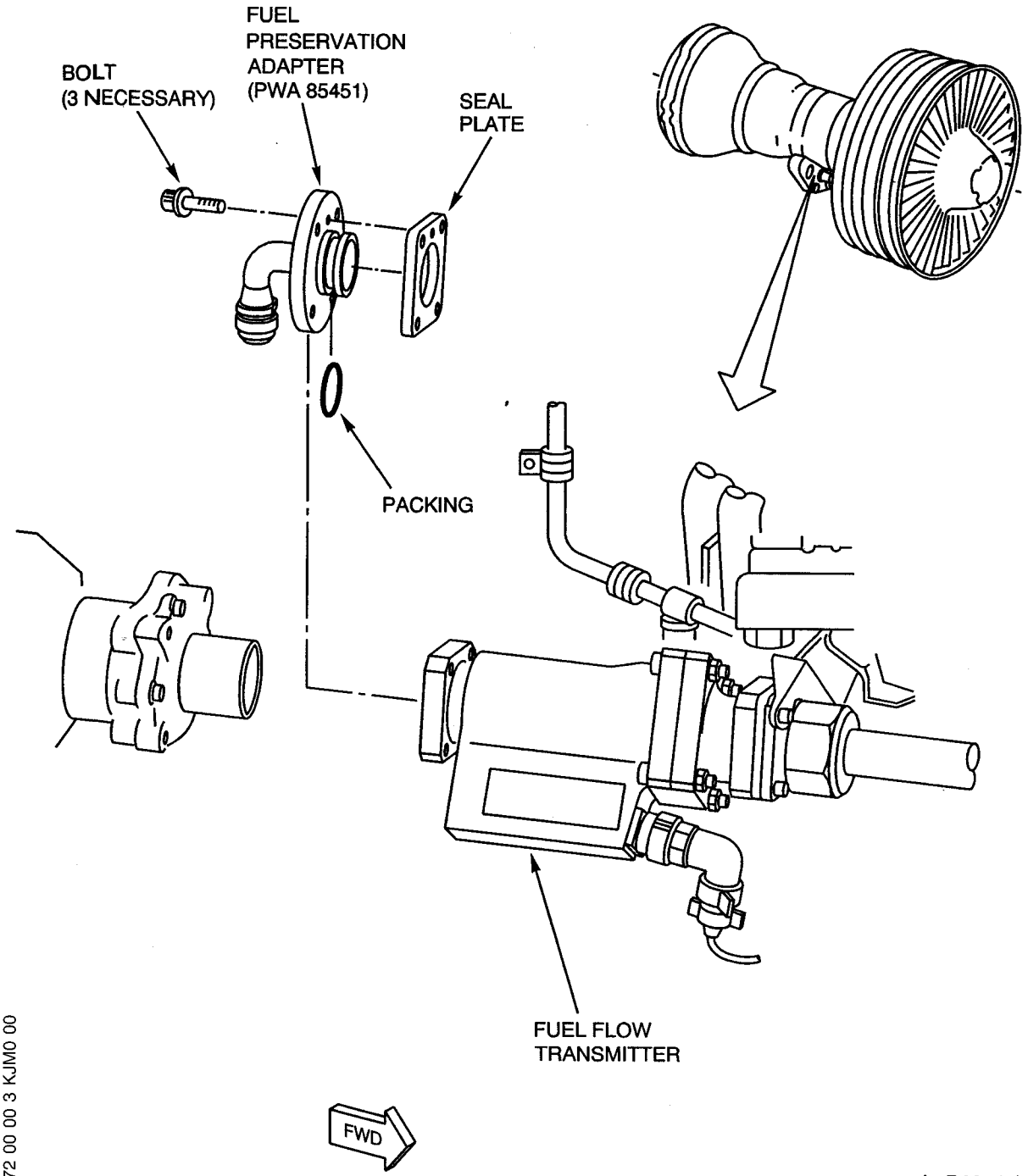
Engine Preservation
Figure 304



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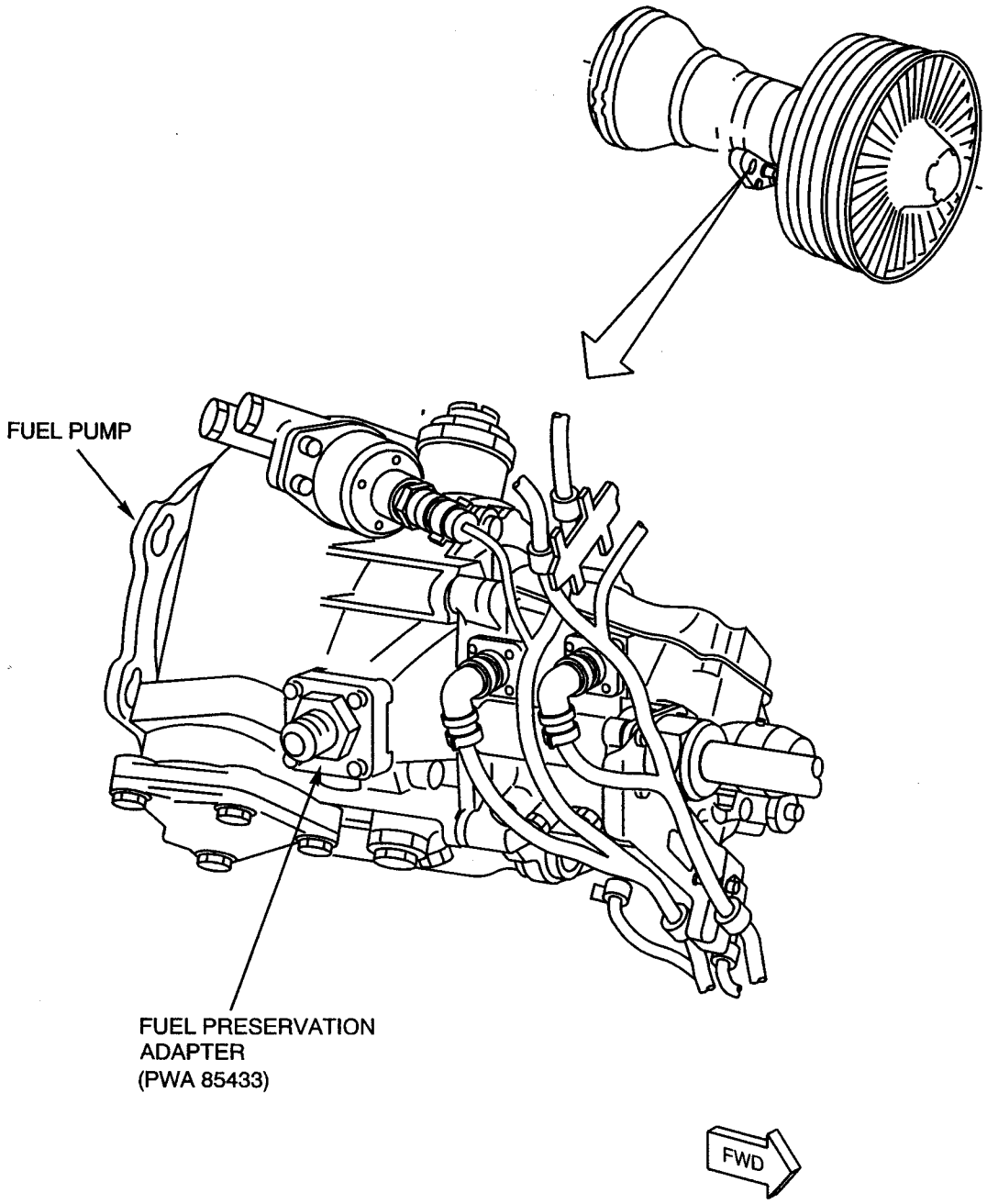
L-D0976 (0503)
PW V

Engine Preservation
Figure 305



L-D0975 (0503)
PW V

BM5 72 00 00 3 KLM0 00

Engine Preservation
Figure 306

1. General Borescope Inspection Procedure and Borescope Access Port (AP) Data

A. General
(Ref. Fig. 601, 602, 603)
(Ref. Fig. 604, 605)
and Ref. Table 601.

WARNING : BORESCOPE INSPECTIONS MUST BE PERFORMED IN A PROTECTED AREA. IF INSPECTIONS ARE PERFORMED IN WET WEATHER, APPROPRIATE PROTECTION MUST BE USED TO PREVENT DAMAGE TO EQUIPMENT OR POSSIBLE ELECTRICAL SHOCK TO THE OPERATOR.

CAUTION : BORESCOPE INSPECTION LIMITS ARE DERIVED FROM TESTING AND STRUCTURAL ANALYSIS. CONTINUED SERVICE OF PARTS AT OR NEAR MAXIMUM LIMITS MAY NOT BE ECONOMICALLY SOUND BECAUSE OF PERFORMANCE LOSS OR REDUCED PART LIFE.

(1) The provisions for borescope inspection of the engine represent a significant aid to effective maintenance. Borescope access is incorporated at 16 locations (1 optional location) along the engine gaspath, allowing for detailed examination of critical internal engine areas.

NOTE : Borescope ports used in the following procedures are identified by their "AP" (access port) designation as shown (Ref. Fig. 601, 602, 603).

(2) Inspection Interval Definition (Regular/Reduced)

(a) The Regular Inspection Interval referred to in this procedure is obtained from the Maintenance Planning Document. The Reduced Inspection Interval is set at half that value. These inspection intervals may be adjusted based on operator experience and consultation with the local regulatory agency.

(b) The maximum damage limit assigned to either inspection interval is such that, under normal circumstances, the damage should not progress beyond an operable condition before the end of the applicable inspection interval. Usually, a greater level of damage is allowed when inspecting at a reduced interval than at a regular interval because the increased inspection frequency greatly reduces the chances of the damage progressing beyond the operable condition before the next inspection. For some features, however, the damage is so critical that an expanded (reduced interval) limit is not prudent. Hence, the limit will be the same for regular and reduced intervals.

(3)No data is given in table 601 to inspect the LPC airfoils between the stage 1.6 and stage 4 blades. However, if damage is seen while viewing through the fan inlet, the allowable damage limit given for the 4th stage vanes in step 2.C.(4) will apply to LPC stages 1.6, 2 and 3 vanes. And the damage limits given for the 4th stage blades in step 2.C.(5) will apply to the stage 2 and 3 blades.

NOTE : For location of access ports quoted in Table 601 (Ref. Fig. 603).

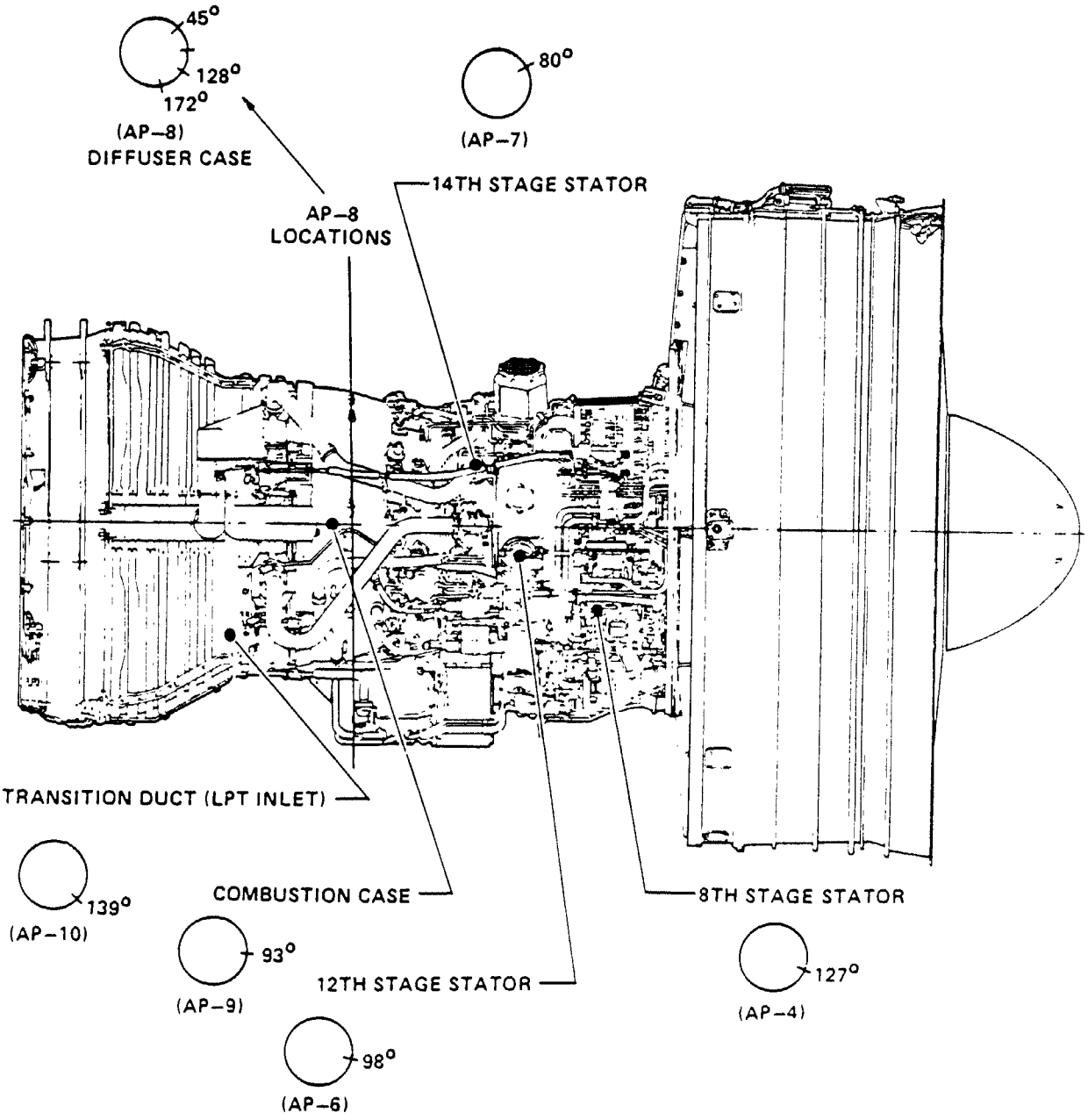
Borescope Access Port (AP) Data
Table 601

Access Port	Angular Location Clockwise from Rear	Part(s) Viewable for Inspection	Recommended Maximum Probe Diameter (In./mm)
Thru Fan	---	1st C-Vane 1.6 C-Blade	---
AP-1	245° (1)	Rear of 4th C-Blade Front of 4th C-Vane	---
AP-2	233°	Rear of 5th C-Blade Front of 6th C-Blade	(0.27/6.8) (0.27/6.8)
AP-3	231°	Rear of 6th C-Blade Front of 7th C-Blade	(0.27/6.8) (0.27/6.8)
AP-4	127°	Rear of 8th C-Blade Front of 9th C-Blade	(0.27/6.8) (0.27/6.8)
AP-5	214°	Rear of 10th C-Blade Front of 11th C-Blade	(0.27/6.8) (0.27/6.8)
AP-6	98°	Rear of 12th C-Blade Front of 13th C-Blade	(0.27/6.8) (0.27/6.8)
AP-7	80°	Rear of 14th C-Blade Front of 15th C-Blade	(0.27/6.8) (0.27/6.8)
AP-8	45° 128° 172° (2) 225° 277° 338°(1)(5)	Fuel Injector Combustion Chamber 1st T-Vane	(0.44/11.3) (0.44/11.3)
AP-9	93°	Front of 1st T-Vane Front of 1st T-Blade	(0.27/6.8) (0.27/6.8)
AP-10	139°	Rear of 2nd T-Blade Front of 3rd T-Vane	(0.27/6.8) (0.27/6.8)
AP-11	215° (4)	Rear of 1sT T-Blade Front of 2nd T-Blade	(0.44/11.3)
Thru Exhaust, Case Struts	---	6th T-Blade 6th T-Vane	---

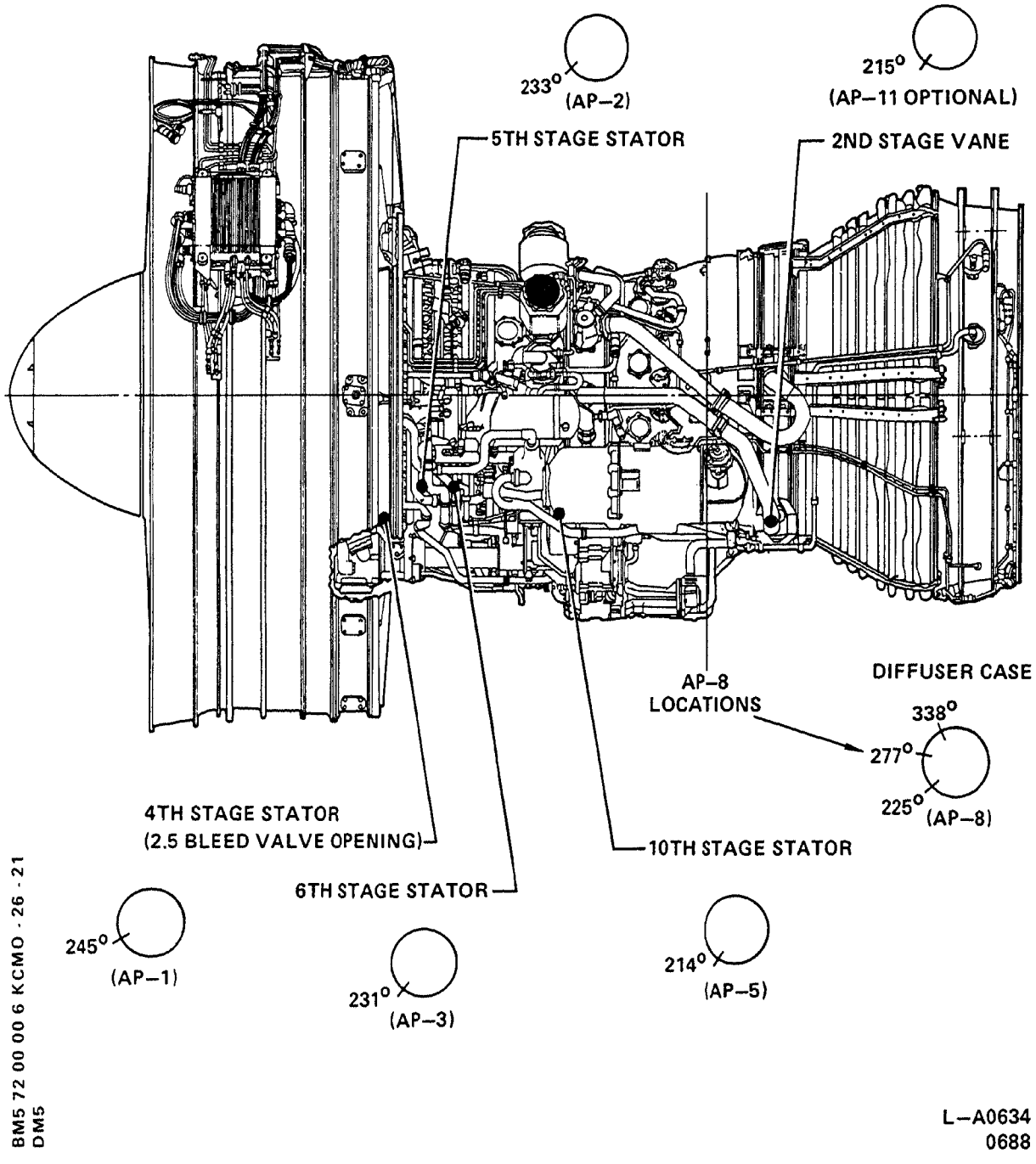
NOTE : (1) Flexible probe required at this access port. (optional all other ports)
(2) Right angle eye piece required at this access port.
(3) Right angle eye piece desirable at this access port.
(4) Optional borescope port location
R (5) Removal of high temperature sensor ; if it is
R necessary to gain access to 338° port, use

Access Port	Angular Location Clockwise from Rear	Part(s) Viewable for Inspection	Recommended Maximum Probe Diameter (In./mm)
R	a flex borescope (Ref. 36-11-18, P. Block 401).		

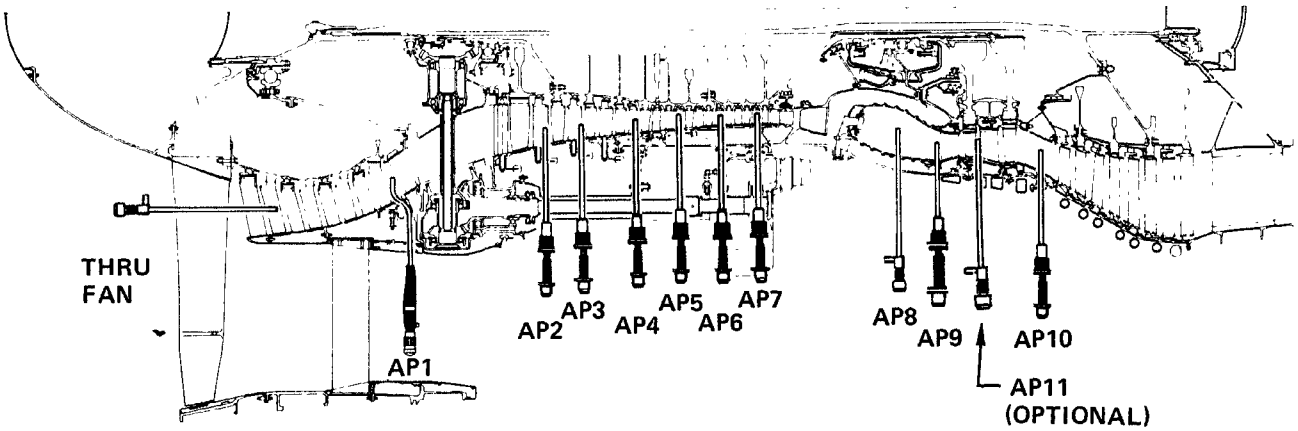
NOTE : For inspection depth, probe working length, borescope overall length, cowl clearance (Ref. Fig. 605).



Borescope Access Ports (Right Side)
Figure 601



Borescope Access Ports (Left Side)
Figure 602



AP2–7, 9, 10 .....LOW MAGNIFICATION RIGID BORESCOPE,
(.270 INCH/6.8 mm BARREL DIA. MAX.)

AP8, 11.....HIGH MAGNIFICATION RIGID BORESCOPE,
(.444 INCH/11.3 mm BARREL DIA. MAX.)

AP–1,.....FLEXIBLE BORESCOPE,
(OPTIONAL FOR AP2–7) (.270 INCH/6.8 mm CABLE DIA. MAX.)

THRU FAN.....FLEXIBLE BORESCOPE
(STG. 1 VANE, STG. 1.6 BLADE) (.270 INCH/ 6.8 mm CABLE DIA. MAX.)

–OR–

LOW MAGNIFICATION RIGID BORESCOPE
(.270 INCH/ 6.8mm BARREL DIA. MAX.)

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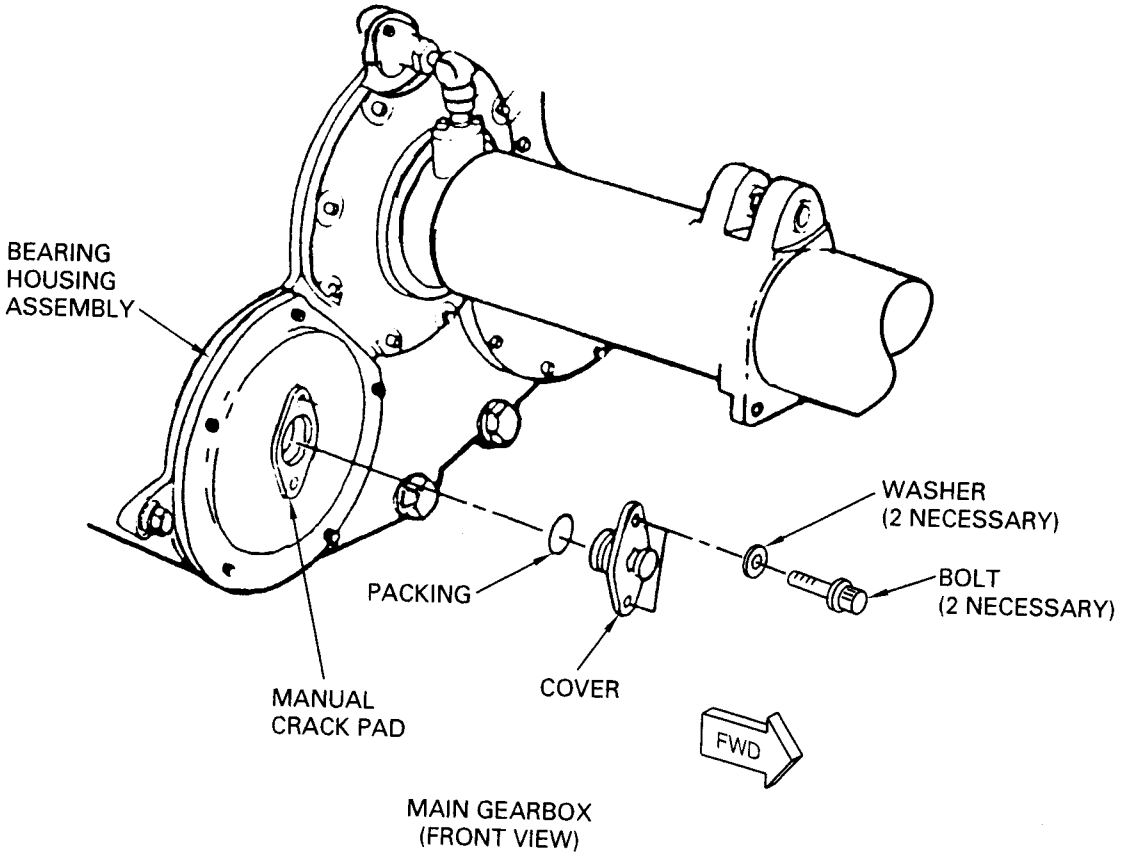
Borescope Access Ports Locations
Figure 603



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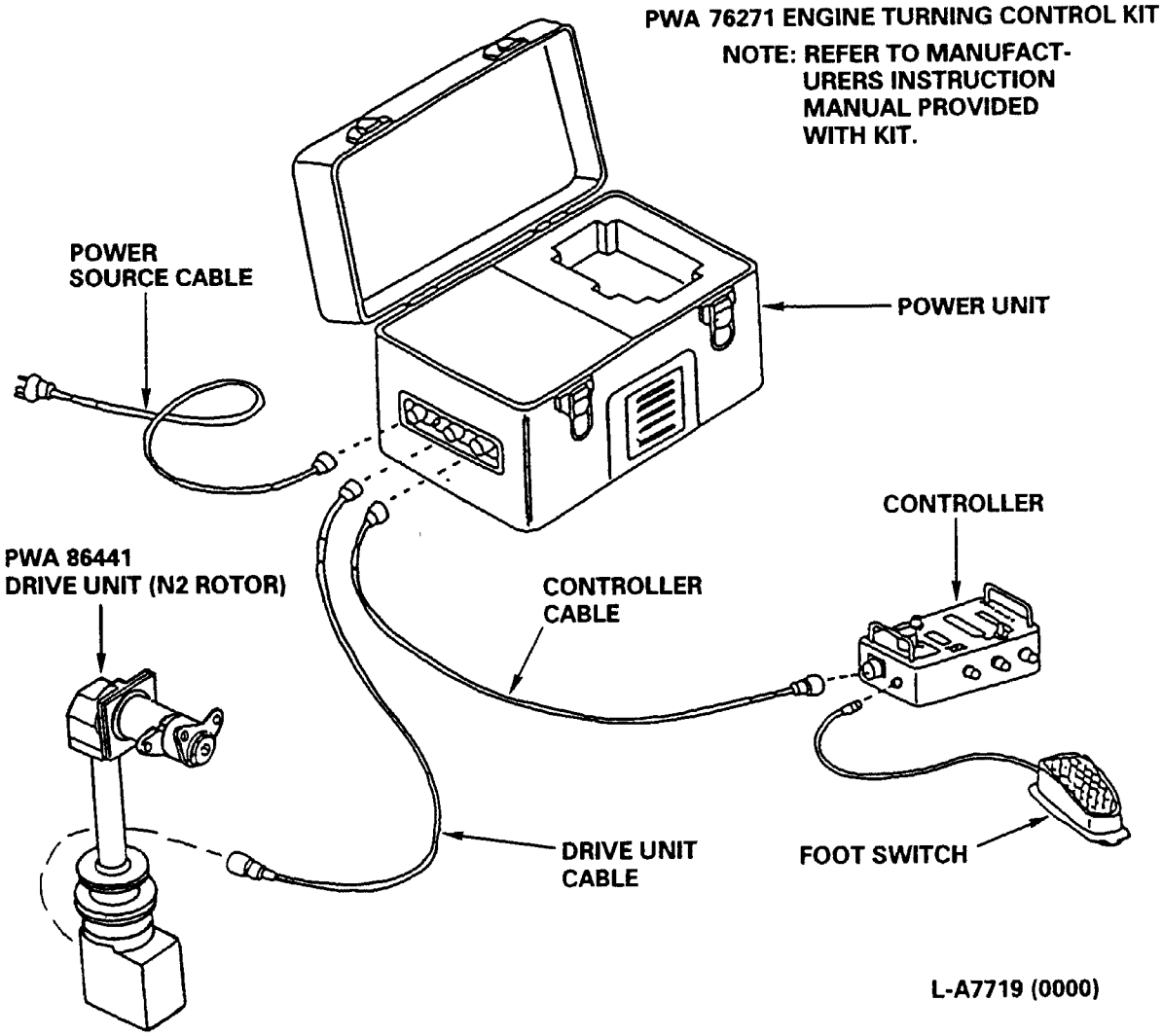
Manual Crank Pad Locations (Sheet 1/2)
Figure 604



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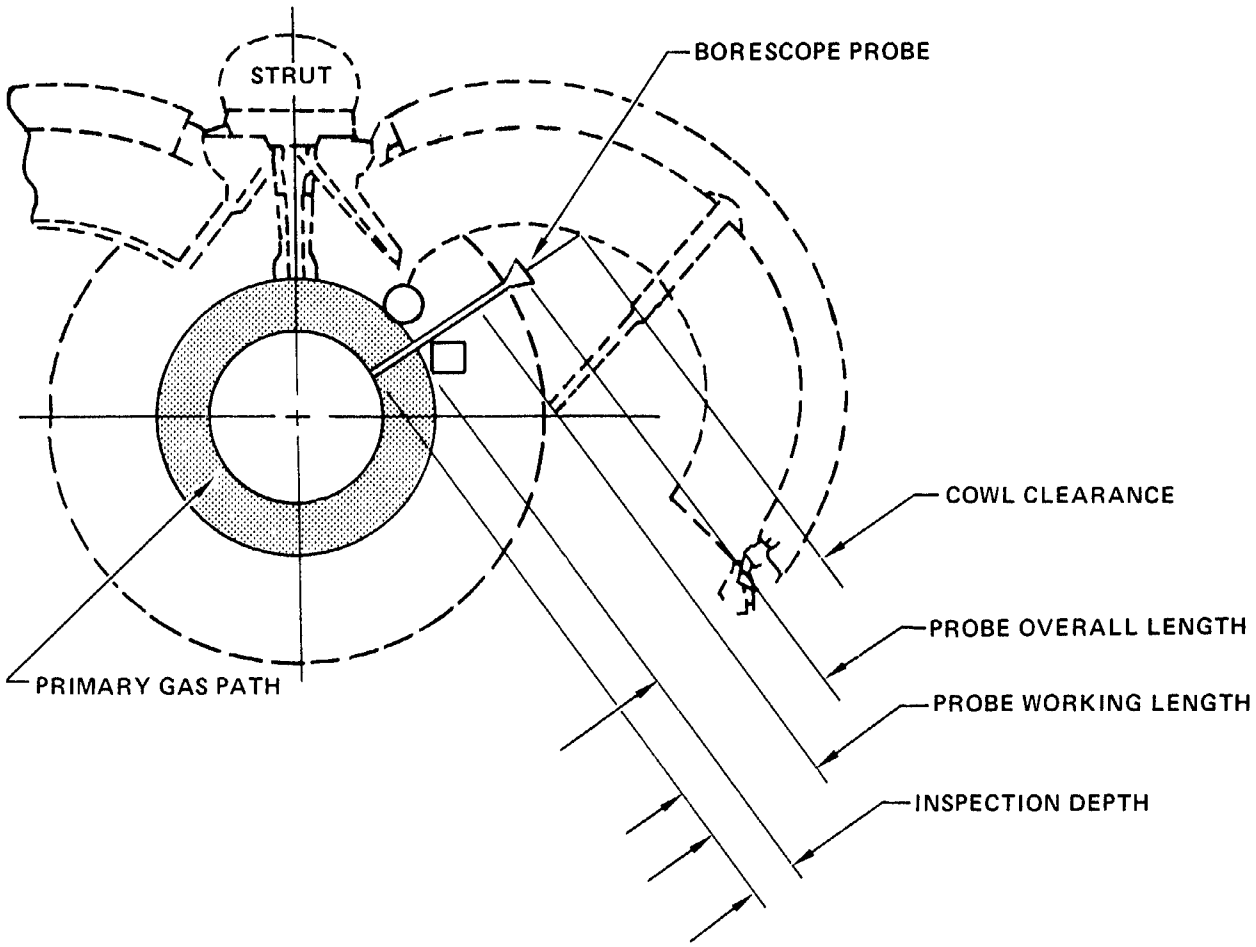
Manual Crank Pad Locations (Sheet 2/2)
Figure 604



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Borescope Probe Working Specifications
Figure 605

B. Special Borescope Equipment

CAUTION : TEMPERATURES IN AREAS TO BE BORESCOPED SHOULD BE PERMITTED TO COOL BELOW 150°F (65.6°C) FOLLOWING ENGINE OPERATION.
DAMAGE MAY RESULT TO BORESCOPE EQUIPMENT IF EQUIPMENT IS EXPOSED TO GASPATH OR METAL TEMPERATURES IN EXCESS OF 150°F (65,6°C).
AS A GUIDE, IF ADJACENT CASES ARE TO HOT TO TOUCH COMFORTABLY, BORESCOPE INSPECTION SHOULD BE DELAYED.

(1)Borescope inspection equipment for the PW4000 Engine should satisfy the
R requirements of CTE6181 as published by Support Equipment Engineering, Pratt & Whitney, Commercial Products Division, 400 Main Street East Hartford, CT 06108, M.S. 11803.

(2)Specification CTE6181 identifies the equipment and associated hardware (such as power source, light cables, adapter etc.) required during borescope inspection and sets quality and functional standards for this equipment. In summary the following borescoping equipment is recommended :

(a)Low magnification rigid borescope,.....AP2-7, 9
(0.27 in./6.8 mm barrel dia. max.)

(b)High magnification rigid borescope,.....AP8, 11
(0.44 in./11.3 mm barrel dia. maximum)

(c)Flexible borescope,.....AP-1,
(0.27 in./6.8 mm cable dia. max) (optional for AP2-7)

(3)Optional borescope equipment and sizes are also provided in CTE 6181 to enhance the borescoping capability and ease the task for the inspector. These items range from clamping equipment to hold the borescope in position to optical video equipment to view and videotape record the borescoping session for later in depth review.

C. Rotation of High Pressure Rotor During Borescope Inspection (Ref. Fig. 604)

(1)Equipment and Materials

ITEM	DESIGNATION
(1)PWA49058	Rotator, Hand Ratchet (Optional to PWA85572-1, PWA85572-2, or PWA86441)
(2)PWA85572-1	Compressor Rotating Kit (Foot Operated) (Optional to PWA85572-2, PWA86441, or PWA49058)
(3)PWA85572-2	Compressor Rotating Kit (Hand Operated) (Optional to PWA85572-1, PWA86441, or PWA49058)
(4)PWA85768	Puller, Knocker
(5)PWA86441	Drive Unit (Used with PWA76271) (Optional to PWA85572-1, PWA85572-2, or PWA49058)
(6)PWA76271	Control Kit, Engine Turning (Used with PWA86441)
(7)PWA102089	Control Kit, Engine Turning (Alternate to PWA85572-1 and PWA85572-2) (Used with PWA102093 or PWA102390)

ITEM	DESIGNATION
(8)PWA102093	Drive Adapter, Engine Turning (Used with PWA102089) (Optional to PWA102390)
(9)PWA102390	Drive Adapter, Engine Turning (Used with PWA102089) (Optional to PWA102093)
10)Material No.P03-001	Oils (Ref. 70-00-00)
11)	Packing
R 12)Material No.P06-054	Lubricants (Ref. 70-00-00)
Referenced Procedure	
- 71-00-00, P. Block 501	General

(2)Procedure

(a)Full 360 degree borescope inspection of the high pressure rotor can be accomplished using the rotor-cranking provision on the gearbox.

(b)Remove manual crank pad cover (Ref. Fig. 604) (Sheet 1/2) on main gearbox.

CAUTION : DO NOT REMOVE THE GEARBOX (SCAVENGE PUMP DRIVE) BEARING HOUSING ASSEMBLY. INSTALLATION OF THE BEARING HOUSING ASSEMBLY IS DIFFICULT. INCORRECT INSTALLATION WILL DAMAGE THE BEARING.

1 Remove two bolts and two washers securing manual crank pad cover. Using PWA85768 Puller, remove crank pad cover. Discard packing from stem of cover.

NOTE : If the engine has been still for ever 2 hours since shutdown, oil leakage can be found when the manual crank pad cover is removed. Oil accumulation behind this cover can occur due to leak-back from the oil tank through the oil pump. This condition is considered normal so no maintenance action is required.

(c)To install the pneumatic N2 rotor turning tool :

1 Attach PWA85572-1 Foot Operated Rotator or PWA85572-2 Hand Operated Rotator to N2 rotator pad. Make sure socket drive in the angle drive adapter aligns correctly with hex end of oil pump idler gear in gearbox and secure using two 1/4 - 28 cap screws provided. Attach an air supply to the pneumatic motor. Actuate using foot or hand control.

NOTE : Use of a motor-drive unit will free operator to use both hands to position and adjust the borescope. It is recommended that rotation be stopped as each rotor blade is positioned properly for inspection. This will allow thorough, detailed appraisal of each blade's condition.

(d)To install the alternate Jupitor Corporation Electronic N2 rotor turning tool kit (Ref. Fig. 604) (Sheet 2/2)

1 Engage the PWA86441 drive unit to the hex shaped internal drive at the N2 rotator pad and connect with two 1/4 x 20 nuts. Engage this drive unit to the power unit detail of the PWA76271 control kit with the detail cable as shown in figure.

2 Use the remaining three cables to connect the controller and the power source to the power unit detail and the remote foot switch to the controller. Set the controller so the preprogramed instructions in the controller match the engine being inspected.

3 Operate the digital turning tool, during borescope inspection, in accordance with the manufactures instruction manual included with the PWA76271 kit.

(e)Install the optional PWA49058 Hand Rotator as follows :

1 Install the detail socket and adapter on the ratchet assembly.

2 Install the tool to the gearbox drive pad. Make sure the socket and adapter align with the gear box spur gear. Attach the tool with the jam nuts.

3 Use the ratchet handle to turn the engine for the borescope inspection. The handle has a control lever to turn the engine in the clockwise or counterclockwise direction.

(f)Install the alternate PWA102089 Controller Kit as follows :

1 Install the PWA102093 Drive Adapter or PWA102390 Drive Adapter to the N2 rotator pad. Make sure the drive in the drive adapter aligns correctly with the hex end of the oil pump idler gear in the gearbox.

2 Attach the power drive unit of the PWA102089 Controller Kit to the PWA102093 Drive Adapter or the PWA102390 Drive Adapter.

3 Follow the manufacturer's instructions for assembly of the rotator kit.

4 Connect the electrical power cable to a power source.

(g)Remove the rotator from the gearbox.

1 Remove the power cable from the power unit or remove the air supply to the pneumatic motor.

2 Remove the cables from the rotator and the controller.

3 Remove the two rotator attachment bolts.

4 Remove the rotator from the gearbox.

(h)After the borescope inspection, install the manual crank pad cover as follows: (Ref. Fig. 604) (Sheet 1/2).

1 Install packing, lubricated with Material No.P03-001, in groove on stem of manual crank pad cover.

R Install cover and secure with two washers and two bolts lubricated with Material No.P06-054. TORQUE bolts to between 62 and 72 lbf.in. (0.70 and 0.81 m.daN).

2 Do an oil leak check of the manual crank pad cover (Ref. 71-00-00, P. Block 501, Test No. 3 - Doors closed or doors opened) or do an oil system static leak test (Ref. 71-00-00, P. Block 501, Test No. 5).

2. Perform Borescope Inspection of Low Pressure Compressor (LPC)

A. Equipment and Materials
NOTE : See paragraph 1. B. for borescope equipment.

ITEM	DESIGNATION
(1)PWA102757	Wedge, Block - Fan Blade, LPC (3 are necessary during windy conditions)
(2)Material No.P03-001	Oils (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 72-23-05, P. Block 401	Fan Exit Liner Segments

B. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure for Inspecting Stage 4 LPC Blades and Vanes
WARNING : DO NOT DO A BORESCOPE INSPECTION IF THE WIND IS MORE THAN 3 MPH (4.8 KPH). DURING WINDY CONDITIONS, THE N1 ROTOR CAN TURN (WINDMILL). THIS CAN CAUSE INJURY TO INSPECTION PERSONNEL AND DAMAGE TO BORESCOPE EQUIPMENT.
WARNING : INSTALL PWA102757 WEDGES BETWEEN THE FAN BLADES DURING MILD WIND, LESS THAN 3 MPH (4.8 KPH) CONDITIONS. IF YOU DO NOT INSTALL THE WEDGES DURING MILD WIND CONDITIONS, THE N1 ROTOR CAN TURN (WINDMILL). THIS CAN CAUSE INJURY TO INSPECTION PERSONNEL AND DAMAGE TO BORESCOPE EQUIPMENT.
(1)If there are mild wind conditions less than 3 miles per hour (4.8 KPH), install PWA102757 Wedges as follows.
(a)Do not install the PWA102757 Wedge if the wind is more than 3 miles per hour (4.8 KPH).
(b)Install two or three PWA102757 Wedges between several fan blades and the fan case at approximately the 6 o'clock location.
(c)Make sure the wedge is installed tight enough to prevent the fan blades from turning but they must not raise the fan blades up.
(d)The red warning streamer must go towards the front of the engine inlet.
(e)If it is necessary to turn the N1 rotor to complete the borescope inspection, you will have to remove the wedges, turn the fan rotor by hand and install the wedges again. Do this procedure again until the borescope inspection is complete.

(2)Access to LPC stage 4 blades and vanes is provided at AP-1 access port location through any of fourteeen (14) openings in the fan exit case inner liner and an open 2.5 bleed valve (Ref. Fig. 606). Refer to Table 601 for additional AP-1 borescope access port data.
NOTE : Eight (8) of the fourteen (14) openings in the fan exit case inner liner across top of engine contain screens which must be removed to gain borescope access. The remaining six (6) openings across bottom of engine do not contain these screens and borescope access

is direct.

CAUTION : TEMPERATURES IN AREAS TO BE BORESCOPED SHOULD BE PERMITTED TO COOL BELOW 150°F (65.6°C) FOLLOWING ENGINE OPERATION.
DAMAGE MAY RESULT TO BORESCOPE EQUIPMENT IF EQUIPMENT IS EXPOSED TO GASPATH OR METAL TEMPERATURES IN EXCESS OF 150°F (65.6°C).
AS A GUIDE, IF ADJACENT CASES ARE TO HOT TO TOUCH COMFORTABLY, BORESCOPE INSPECTION SHOULD BE DELAYED.

(3)Remove screens, as necessary,
(a)Remove applicable fan exit liner segment (Ref. 72-23-05, P. Block 401).
(b)Remove bolts and washers securing bleed valve ducts and screens.
(c)Remove ducts and screens.

(4)Insert a flexible (non-rigid) borescope through the AP-1 opening, and inspect condition of stage 4 vanes and blades. Damaged parts must be evaluated for serviceability as described in steps (5) and (6).

CAUTION : THE FOLLOWING CONTINUE-IN-SERVICE LIMITS FOR FOREIGN OBJECT DAMAGE OBSERVED THROUGH AP-1 BORESCOPE INSPECTION PORTS ARE INTENDED AS A GUIDE TO DETERMINE WHETHER ENGINE MAY REMAIN IN SERVICE OR A REPAIR IS NECESSARY. IT IS IMPORTANT THAT CAUSE OF FOREIGN OBJECT DAMAGE BE DETERMINED TO ENSURE COMPRESSOR INTEGRITY SINCE IT MAY BE AN INDICATION OF MORE SERIOUS PROBLEMS. SHOULD COMPRESSOR INTEGRITY BE QUESTIONED, COMPONENT IS TO BE REPLACED.

(5)Borescope inspection (continue-in-service) limits for Stage 4 vanes (Ref. Fig. 607, 608).

NOTE : During borescope inspection, if a potential defect appears to exceed the allowable "dammage limits", examine the area closely to determine if the condition being evaluated is a defect or previously blended damage.
(Blended areas are recognizable by a 4 to 1 length to depth blend ratio and smooth round corners.)
This determination is an important one because a blended area could exceed the "damage limits" allowed for a defect.

(a)Damage in form of nicks and dents on leading and trailing edge which are shallower than 0.050 in. (1.270 mm) deep and which are at least 0.5000 in. (12.700 mm) apart.
(b)Damage on both edges must not be directly opposite and must be separated diagonally by minimum distance equal to mean chordal length of vane.
(c)Dents in area A which are less than 0.010 in. (0.254 mm) deep and which are at least 1.000 in. (25.400 mm) apart. Any material tears in this area must be repaired by replacing vanes.

(6)Borescope inspection (continue-in-service) limits for stage 4 blades (Ref. Fig. 609).

NOTE : During borescope inspection, if a potential defect appears to exceed the allowable "damage limits", examine the area closely to determine if the condition being evaluated is a defect or previously blended damage.
(Blended areas are recognizable by a 4 to 1 length to depth blend

ratio and smooth round corners.)
This determination is an important one because a blended area could exceed the "damage limits" allowed for a defect.

(a) Damage approximately 0.0312 in. (0.792 mm) deep in area A and which is at least 1.000 in. (25.400 mm) apart on either leading or trailing edge.

(b) Damage on both edges must not be directly opposite and must be separated diagonally by a minimum distance equal to mean chordal length of blade (Ref. Fig. 608).

(c) Damage in area B which is smaller than 0.0312 in. (0.792 mm) round bottomed indication and which does not have material tears.

(d) Damage in area C is not allowed unless blended.

(7) Install screens, ducts, and fan exit liner segments.

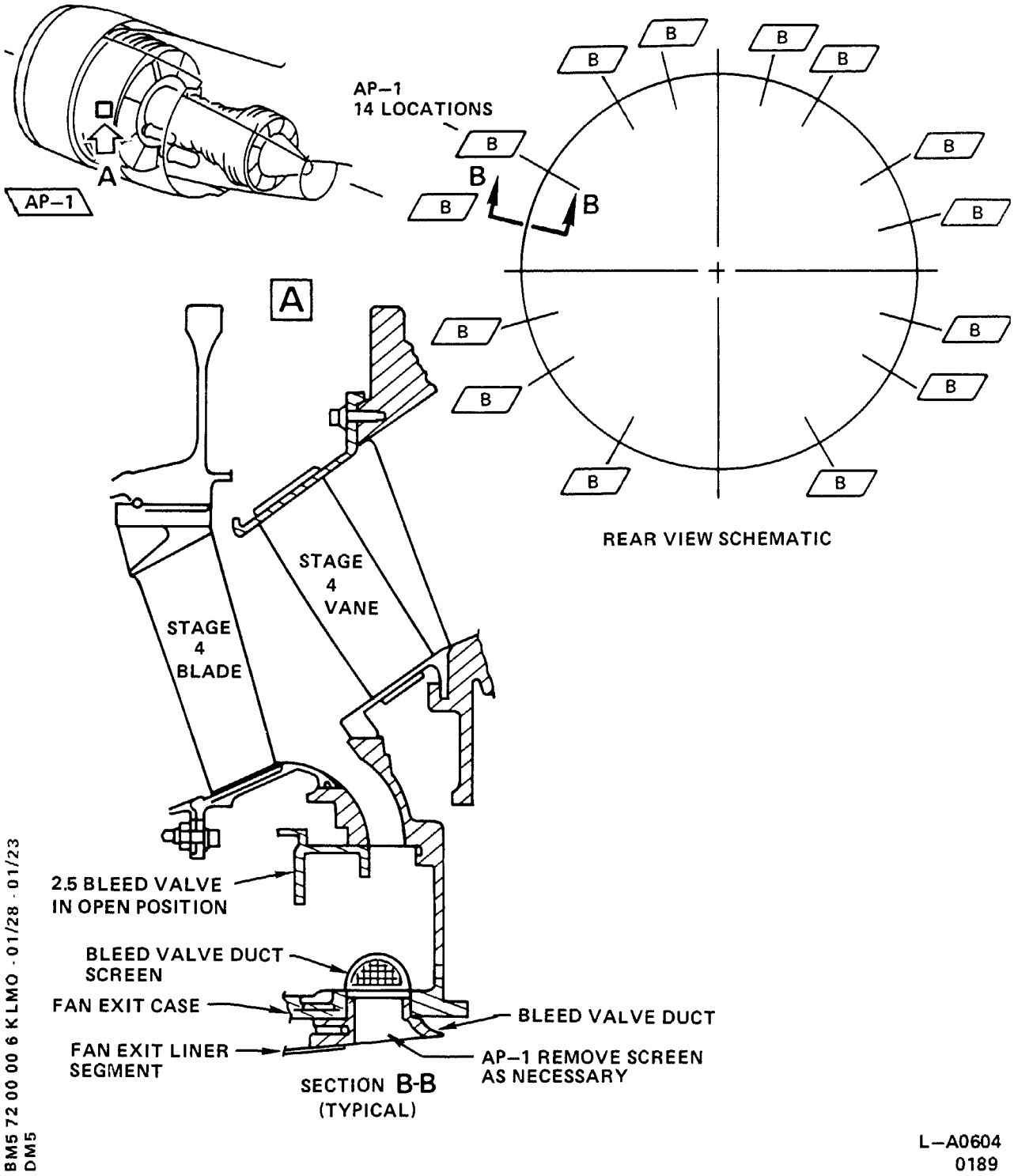
(a) Install screen and ducts and secure with bolts and washers. Lubricate bolts with Material No.P03-001 and TORQUE bolts to between 36 and 40 lbf. in. (0.41 and 0.45 m.daN).

(b) Install fan exit liner segments (Ref. 72-23-05, P. Block 401).

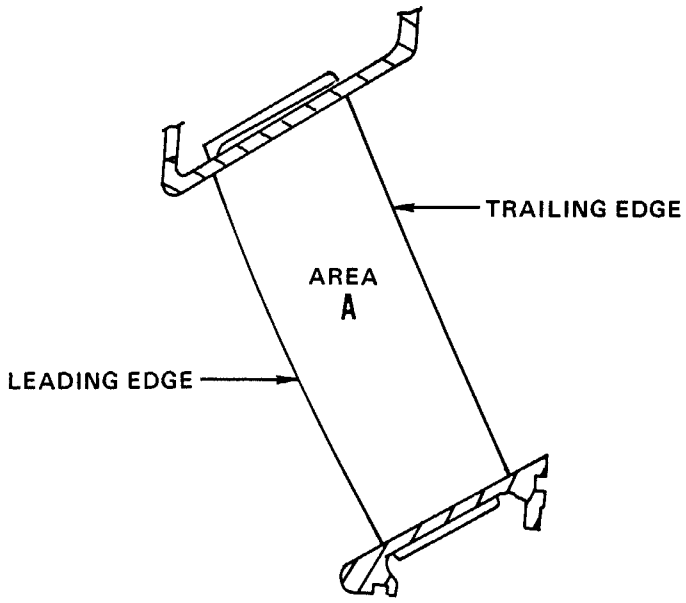
CAUTION : ALL THE PWA102757 WEDGES MUST BE REMOVED AFTER THE BORESCOPE INSPECTION IS COMPLETE.
IF THE WEDGES ARE NOT REMOVED, THE ENGINE WILL BE DAMAGED WHEN THE ENGINE IS STARTED.

(8) Carefully remove all the PWA102757 Wedges after all borescope inspections are complete.

D. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



LPC Stage 4 Borescope Access Port (AP-1)
Figure 606



AREA A – CONCAVE AND CONVEX SURFACES

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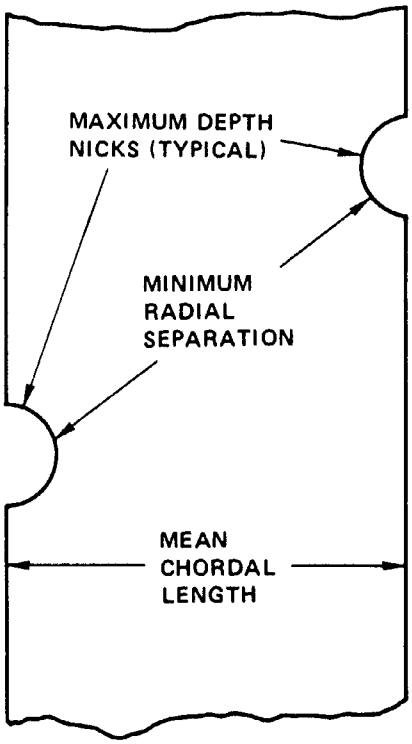
Stage 4 LPC Vane Service Limits
Figure 607



LPC VANE

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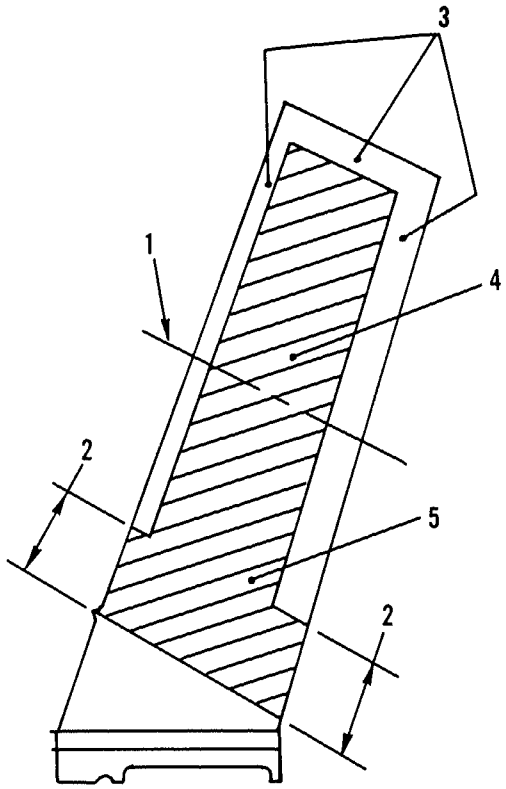
Compressor Vanes Proximity of Nicks Between
Leading and Trailing Edges
Figure 608



1. APPROXIMATE AIRFOIL CENTERLINE
2. 0.500 INCH (12.700mm)
3. AREA A
4. AREA B –CONCAVE AND CONVEX SURFACES
5. AREA C –CONCAVE AND CONVEX SURFACES

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LPC Stage 4 Blade Service Limits
Figure 609

3. Perform Borescope Inspection of High Pressure Compressor (HPC)

A. Equipment and Materials
NOTE : See paragraph 1. B. for borescope equipment.
NOTE : See paragraph 1. C. for compressor rotating equipment.

	ITEM	DESIGNATION
	(1)	Circuit Breaker Safety Clips
	(2)	Torque Wrench
	(3)	Keywasher
	(4)PWA75250	Wrench (AP-5/AP-7 Inner Plug)
	(5)PWA86580	Driver (AP-5/AP-7 Inner Plug)
R	(6)PWA101674	Crimper, Mechanical (AP-2/AP-3 Borescope Plugs)
R	(7)PWA105181	Crimper, Mechanical (AP-5/AP-7 Borescope Plugs)
R	(8)Material No.P06-054	Lubricants (Ref. 70-00-00)
	Referenced Procedures	
	- 71-13-00, P. Block 301	Cowl Doors
	- 72-32-02, P. Block 801	Stages 5, 6, and 7 HPC Blades
	- 72-30-00, P. Block 801	Compressor Section

B. Job Set-Up
(1)Open, safety and tag appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure for Inspection HPC Rotor and Stator Assembly
(Ref. Fig. 613, 614, 615)
(Ref. Fig. 616, 617, 618)
CAUTION : SEE THE FOLLOWING STEP FOR ADDITIONAL REQUIREMENTS FOR REMOVING THE AP-2 AND AP-3 PLUGS OR DAMAGE TO THE SYNCHRONIZING RING CAN OCCUR.
(1)Remove plug(s) from borescope access port(s) (AP's). Access to HPC gas-path is provided at six AP locations along the HPC front and rear compressor cases. Identified as AP-2, AP-3, AP-4, AP-5, AP-6 and AP-7, these six access ports enable borescope viewing of specific blade and vane areas as illustrated (Ref. Fig. 613, 614, 615)
(Ref. Fig. 616, 617, 618)
NOTE : Table 601, paragraph 1. A. gives additional AP-2 through -7 data.
NOTE : Post SB PW4ENG 72-756 AP-5 and AP-7 do not have inner plugs.
CAUTION : IF NECESSARY, TURN THE SYNCHRONIZING RINGS FOR ACCESS TO THE AP-2 AND AP-3 PLUGS. DO NOT PRY AGAINST THE RING LEVERS. USE A STANDARD CROWSFOOT WRENCH AND TURN THE BELLCRANK. IF YOU DO NOT DO THIS, DAMAGE TO THE ENGINE CAN OCCUR.
CAUTION : FOR THE AP-2 AND AP-3 PLUGS, THE 6TH STAGE SYNCHRONIZING RING MUST BE IN ITS REARMOST POSITION TO PROVIDE SUFFICIENT CLEARANCE TO REMOVE THE PLUGS OR DAMAGE TO THE SYNCHRONIZING RING CAN OCCUR. WHEN THE SYNCHRONIZING RING IS IN ITS REARMOST POSITION, THE VANE ARMS WILL BE APPROXIMATELY AXIAL TO THE ENGINE.
(2)Do this step if access to AP-2 or AP-3 borescope port plugs (at 7 o'clock

R position) is blocked by the synchronizing ring, Stator Vane Actuator
R (SVA) synchronizing ring arm, or if a better view of the blades and vanes
R is necessary during borescope inspection.

(a)Install a standard crow foot wrench on SVA bellcrank (flats), adjacent to stage 5 adjustor. Push on the wrench in the applicable (up or down) direction. This turns the synchronizing ring and moves the ring arms and variable vanes.

CAUTION : TEMPERATURES IN AREAS TO BE BORESCOPED SHOULD BE PERMITTED TO COOL BELOW 150°F (65.6°C) FOLLOWING ENGINE OPERATION.
DAMAGE MAY RESULT TO BORESCOPE EQUIPMENT IF EQUIPMENT IS EXPOSED TO GASPATH OR METAL TEMPERATURES IN EXCESS OF 150°F (65,6°C).
AS A GUIDE, IF ADJACENT CASES ARE TO HOT TO TOUCH COMFORTABLY, BORESCOPE INSPECTION SHOULD BE DELAYED.

(3)Insert borescope through applicable port (AP-2 through AP-7) and inspect condition of HPC blades and vanes. Damaged parts must be evaluated for serviceability as described in steps (3) through (8).

NOTE : Full 360 degree inspection of the HPC rotor can be accomplished using manual crank pad provision on the main gearbox. See paragraph 1. C.

NOTE : It can be possible to view outer airseal rubstrip areas during borescope inspection of the HPC but rubstrip inspection is not mandatory.

If rubstrips are inspected :
For stages 6 and 7, there is no limit to missing feltmetal, feltmetal disbond, or chunk out provided there is no airfoil damage beyond the acceptable continue-in-service limits and that the engine has no history of operational, or stability abnormalitics.
For the remaining stages, if missing feltmetal, disbond or chunk out is seen, then only up to four areas of material can be missing for a maximum area of 3.000 sq.in. (1935 sq.mm) for any one stage.

(4)Inspect HPC Stages 5 thru 7 blades for curled leading edge/blade tip. Blades within limits listed below and in (Ref. Fig. 619) (Sheet 1/2) are acceptable.

NOTE : Curled leading edge/blade tip is defined as a triangular piece of blade material formed by bending about a line connecting points on leading edge and blade tip, respectively, whose average convex surface contour is greater than 20 degrees but less than or equal to 90 degrees out of plane (toward the covex blade side), with average concave blade contour.

(a)Maximum of six curled blades.
(b)Curled blades must be separated by at least three non-curled blades.
(c)Borescope inspection limits for blade surface damage in all other areas other than Index 5 of (Ref. Fig. 619) (Sheet 1/2) are applicable.

(5)Inspect all HPC stages 5 thru 7 blades for bending of the leading edge (Ref. Fig. 619) (Sheet 2/2).

(a)No bending permitted on adjacent blades.
(b)Bending not permitted on more than (6) blades per stage.
(c)No tears or cracks are permitted. Bends must be smooth and continuous.
(d)No more than one bend per blade is permitted.

(6)Borescope inspect HPC stages 9-15 tangential blade locks.
(a)Inspect for loose/improperly seated blade locks. The engine may be continued-in-service with up to two loose stage 9-15 blade locks (per stage) until the next regularly scheduled HPC disassembly.
(7)Borescope inspect HPC stage 9 through 15 blade seals.
(a)Inspect for loose/missing blade seals. The engine may be continued in service with loose/missing stage 9 through 15 blade seals until the next regularly scheduled HPC disassembly.
(8)Borescope inspection (service limits) compressor blade (stages 5 through 15) - nicks and dents (Ref. Fig. 610, 611, 612).

R

CAUTION : THE FOLLOWING BLADE NICK LIMITS FOR FOREIGN OBJECT DAMAGE OBSERVED THROUGH THE BORESCOPE INSPECTION PORTS ARE INTENDED AS A GUIDE TO DETERMINE WHETHER THE ENGINE MAY REMAIN IN SERVICE OR A REPAIR IS NECESSARY. IT IS IMPORTANT THAT THE CAUSE OF THE FOREIGN OBJECT DAMAGE BE DETERMINED TO ENSURE COMPRESSOR INTEGRITY SINCE IT MAY BE AN INDICATION OF MORE SERIOUS PROBLEMS. SHOULD COMPRESSOR INTEGRITY BE QUESTIONED, THE COMPONENT IS TO BE REPLACED.

NOTE : During borescope inspection, if a potential defect appears to exceed the allowable "damage limits", examine the area closely to determine if the condition being evaluated is a defect or previously blended damage.

R NOTE : Blended areas are recognizable by a 4 - 1 length to depth blend
R ratio and smooth round corners.

R NOTE : This determination is an important one because a blended area
R could exceed the "damage limits" allowed for a defect.

R NOTE : Stages 12 and 13 blades cannot be in-situ blended for an engine
R that has incorporated the HPC ring case since it prevents the
R ability to insert the blending tool through the AP-6 borescope
R port.

R (a)HPC continue-in-service and repairable limits are provided on the
R (Ref. Fig. 610, 611, 612). The borescope ports for each stage are
R provided as follows :

STAGE (BLADES)	AP PLUG
Stage 5	(AP-2)
Stage 6	(AP-2/AP-3)
Stage 7	(AP-3)
Stage 8	(AP-4)
Stage 9	(AP-4)
Stage 10	(AP-5)
Stage 11	(AP-5)
Stage 12	(AP-6)
Stage 13	(AP-6)
Stage 14	(AP-7)
Stage 15	(AP-7)

R (b)Compressor blade damage limits (continue-in-service limits)(stages 5
R thru 15) are provided on (Ref. Fig. 610).

	Area A	Area B (Airfoil Only)	Area C Depth Inch (mm)	Area E Depth Inch (mm)	Area D	Index 1 Inch (mm)
Stage 5	See the Limits Below.	See the Limits Below.	1/32 (0.794)	1/64 (0.397)	None Allowed	1/2 (12.700)
Stage 6 Thru. 8	See the Limits Below.	See the Limits Below.	1/32 (0.794)	1/64 (0.397)	See the Limits Below.	1/2 (12.700)
Stage 9 Thru. 12	See the Limits Below.	See the Limits Below.	1/32 (0.794)	1/32 (0.794)	See the Limits Below.	1/2 (12.700)
Stage 13 Thru. 15	See the Limits Below.	See the Limits Below.	1/32 (0.794)	1/32 (0.794)	See the Limits Below.	0.38 (9.652)

Blade Area	Service Limits	Notes
A	1/4 in. (6.350 mm) corner broken-off completely is acceptable. Curled, deformed or impact damaged material is acceptable in this Area.	Nicks and dents near leading edge and trailing edge corners are NOT critical.
B	Indentations contained in this area are acceptable. Raised spots on opposite side of foil are acceptable if no cracks are present.	Raised spots on opposite side of air-foil are result of indentations.
C	Multiple damage on the same blade edge that is 1/32 inch (0.794 mm) deep or less is acceptable. There is no separation Requirement for damage on the same edge. Damage 1/32 inch (0.794 mm) deep or less, on both leading and trailing edges is acceptable. There is no separation requirement for damage on opposite blade edges.	Nicks in leading edge and trailing edge become critical closer to blade root. Damage with small radii or ragged edges are especially critical.
D	Stage 5 No damage permitted except small surface imperfections caused by erosion are permitted.	The erosion imperfections will look larger because of the borescope magnifications.

	Blade Area	Service Limits	Notes
	D	Stages 6 through 8 No damage permitted except small surface imperfections caused by erosion or smooth round bottomed indentations. A maximum of 0.006 in. (0.152 mm) depth imperfections is permitted outside fillet and a maximum of 0.003 in. (0.076 mm) depth imperfections permitted in fillet provided there is no raised material, no sharp discontinuities, and no multiple overlapping indentations. No cracks permitted.	The Imperfections will look larger because of the borescope magnification.
	D	Stages 9 through 15 No damage permitted except small surface imperfections caused by erosion or smooth round bottomed indentations. A maximum of 0.006 in. (0.152 mm) depth imperfections is permitted outside fillet and a maximum of 0.003 in. (0.076 mm) depth imperfections permitted in fillet provided there is no raised material, no sharp discontinuities, and no multiple overlapping indentations. No cracks permitted. Signs of overheating (blueing) are permitted on the tip of the airfoil, but cannot extend down onto the concave or convex surfaces of the airfoil.	The Imperfections will look larger because of the borescope magnification
	E	Stages 5 thru 8 Multiple damage on the same blade	Nicks in leading edge
R		edge that is 1/64 inch (0.397 mm) deep or less is acceptable. There is no separation requirement for damage on the same edge.	and trailing edge become critical closer to blade root. Damage with small radii or ragged
R		Damage 1/64 inch (0.397 mm). Deep on leading and trailing edges is acceptable. There is no separation requirement for damage on opposite blade edges.	edges are especially critical.
	E	Stages 9 thru 15 Multiple damage on the same blade	Nicks in leading edge
R		edge that is 1/32 inch (0.794 mm) deep or less is acceptable. There is	and trailing edge become critical closer to

Blade Area	Service Limits	Notes
R	no separation requirement for damage on the same edge. Damage 1/32 inch (0.794 mm). Deep or less, on both leading and trailing edges is acceptable. There is no separation requirement for damage on opposite blade edges.	blade root. Damage with small radii or ragged edges are especially critical.

(c)In-situ (assembled engine) blend repairs are permitted (Ref. 72-32-02, P. Block 801) if damage is within the limits shown in (Ref. Fig. 611) and as follows :

	Area C midspan to 0.25 in. (6.35 mm) from tip (max. depth)	Area E 0.25 in. (6.35 mm) above root platform to midspan (max. depth)	Area F 0.19 - 0.25 in. (4.83 - 6.35 mm) above root platform (max. depth)	Area G 0.15 - 0.19 in. (3.81 - 4.83 mm) above root platform (max. depth)
Stage 5	0.144 in. (3.66 mm)	none	none	none
Stages 6 and 7	0.144 in. (3.66 mm)	0.048 in. (1.22 mm)	0.023 in. (0.58 mm)	0.007 in. (0.18 mm)
Stage 8	0.082 in. (2.08 mm)	0.048 in. (1.22 mm)	0.023 in. (0.58 mm)	0.007 in. (0.18 mm)
Stage 9 leading edge only	0.082 in. (2.08 mm)	0.048 in. (1.22 mm)	0.023 in. (0.58 mm)	0.007 in. (0.18 mm)
Stage 10 trailing edge only	0.082 in. (2.08 mm)	0.048 in. (1.22 mm)	0.023 in. (0.58 mm)	0.007 in. (0.18 mm)
Stage 11 leading edge only	0.082 in. (2.08 mm)	0.048 in. (1.22 mm)	0.023 in. (0.58 mm)	0.007 in. (0.18 mm)
Stage 12 trailing edge only	0.082 in. (2.08 mm)	0.048 in. (1.22 mm)	0.023 in. (0.58 mm)	0.007 in. (0.18 mm)
Stage 13 and 14	0.082 in. (2.08 mm)	0.048 in. (1.22 mm)	0.023 in. (0.58 mm)	0.007 in. (0.18 mm)

	Area C	Area E	Area F	Area G
	midspan to 0.25 in. (6.35 mm) from tip (max. depth)	0.25 in. (6.35 mm) above root platform to midspan (max. depth)	0.19 - 0.25 in. (4.83 - 6.35 mm) above root platform (max. depth)	0.15 - 0.19 in. (3.81 - 4.83 mm) above root platform (max. depth)
Stage 15 leading edge only	0.082 in. (2.08 mm)	0.048 in. (1.22 mm)	0.023 in. (0.58 mm)	0.007 in. (0.18 mm)

NOTE : Limits shown in (Ref. Fig. 611) are the maximum size that can be repaired by in-situ repair. The in-situ repair will remove additional material. The final repair depth is controlled by the in-situ repair procedure.

NOTE : Repairs are allowed for the leading and trailing edges except as noted.

1 Blend repairs are only allowed where shown.

2 Multiple blends are permitted to a maximum depth of the limits shown in (Ref. Fig. 610).

3 One blend in each blade is permitted to the maximum depth shown in (Ref. Fig. 611).

4 All blends must be separated by a minimum of 0.125 in. (3.175 mm).

5 Blends on both edges must not be directly opposite and must be separated diagonally by a minimum distance equal to the mean chordal length of the blade (Ref. Fig. 612).

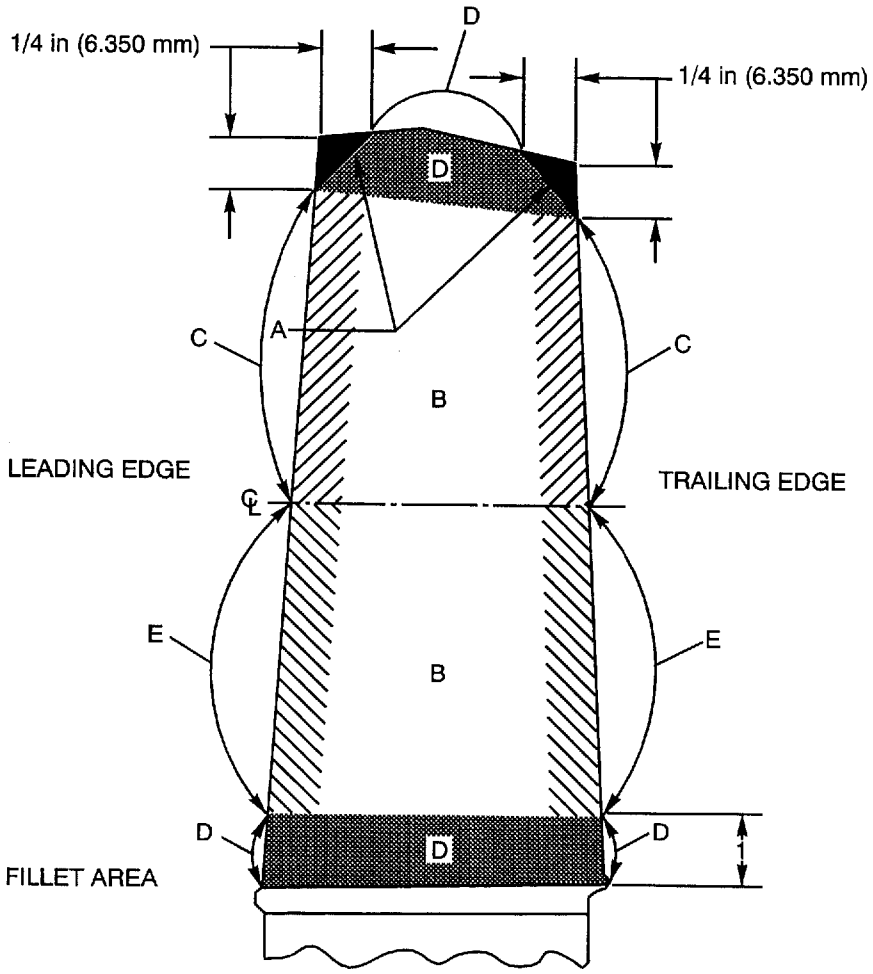
(d) In the following step, nine stages can be blended for the Ring Case Configuration (RCC). Operators should convert to the RCC. There is no limit to the number of blades in a single stage or for all nine stages that can be blended by this repair.

(e) Damage in Area C that is near the change into Area A on the leading and trailing edges only, can be repaired (Ref. 72-32-02, P. Block 801) to the limits of Area C (Ref. Fig. 611). However, tooling clearances with the outer duct can prevent a successful repair. It is not possible to blend damage on the blade tips due to tooling clearance with the outer ducts. If a successful repair cannot be accomplished and the damage exceeds the continue-in-service limits, then the blade must be replaced.

(f) Replace In-situ blend repaired blades at the next overhaul if blend repairs are greater than the overhaul repair limits specified for that blade.

(9) Borescope inspection (service limits) compressor stator vanes (IGV and stages 5 through 15) (Ref. Fig. 620, 621, 622).

CAUTION : THE FOLLOWING VANE NICK LIMITS FOR FOREIGN OBJECT DAMAGE OBSERVED THROUGH BORESCOPE INSPECTION PORTS ARE INTENDED AS A GUIDE TO DETERMINE WHETHER ENGINE MAY REMAIN IN SERVICE OR A REPAIR IS NECESSARY. IT IS IMPORTANT THAT CAUSE OF THE FOREIGN OBJECT DAMAGE BE DETERMINED TO ENSURE COMPRESSOR



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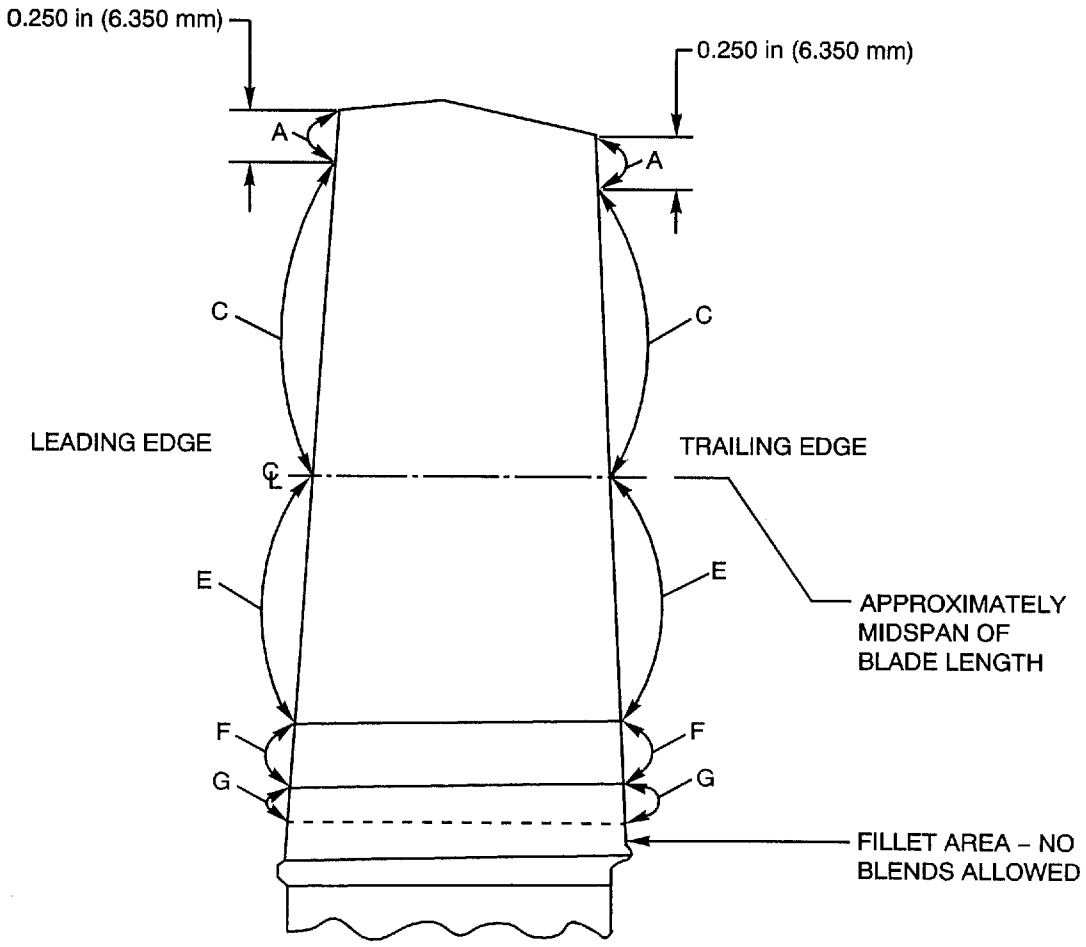
PW V

Compressor Blade Damage Limits
(Continue-In-service Limits)(Stages 5 thru 15)
Figure 610

R



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PW V

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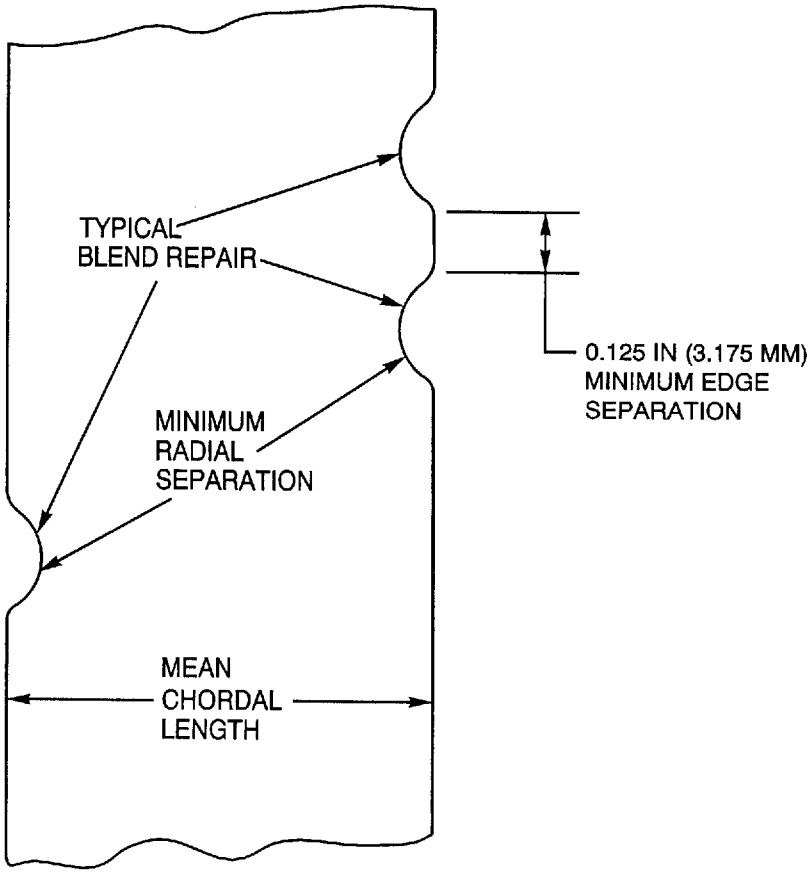
R Compressor Blade In-situ Repair Limits
Figure 611



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PW V

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Compressor Blade - Blend Separation Limits
(Stages 5 thru 15)
Figure 612

R

INTEGRITY SINCE IT MAY BE AN INDICATION OF MORE SERIOUS PROBLEMS. SHOULD COMPRESSOR INTEGRITY BE QUESTIONED, COMPONENT IS TO BE REPLACED

NOTE : During borescope inspection, if a potential defect appears to exceed the allowable "damage limits", examine the area closely to determine if the condition being evaluated is a defect or previously blended damage.
(Blended areas are recognizable by a 4 to 1 length to depth blend ratio and smooth round corners.)
This determination is an important one because a blended area could exceed the "damage limits" allowed for a defect.

(a)Vane service limits - nicks (Ref. Fig. 620, 621, 622).

1 Nicks to maximum depth on leading edge and nicks to maximum depth on trailing edge must not be at same radial station and must be radially separated by not less than vane chordal length. Nicks to leading and trailing edges not to maximum depth limit and within chordal length radial spacing, are acceptable only if combined nicked leading edge depth and nicked trailing edge depth does not exceed above single nick limit.

2 No more than two nicks to maximum depth limit allowed per vane.

3 Total nicked length on any vane edge shall not be in excess of 1/8 of total edge length.

4 No cracks allowed.

(b)Vane Service Limits - missing braze.

1 For 14th stage stator only : Missing braze is permitted at the vane to shroud OD fillet radius for the two 14th stage vanes adjacent to the AP-7 borescope port.

CAUTION : IT IS VERY IMPORTANT TO OBEY THE PROCEDURES IN THE ENGINE STANDARD PRACTICES SECTION OF THE MANUAL, 70-00-00, WHEN YOU INSTALL (BORESCOPE) PLUG KEY WASHERS. INCORRECT INSTALLATION OF THE KEY WASHERS CAN CAUSE THE (BORESCOPE) PLUG TO COME OUT. IF AN AP-5 OR AP-7 (BORESCOPE) PLUG IS NOT THERE, HOT GASES FROM THE PLUG OPENING CAN CAUSE DAMAGE TO THE THRUST REVERSER.

(10)After borescope inspection, reinstall applicable AP-2 through AP-7 plug(s) and where removed, a new key washer per requirements of Table 602 and as follows :

CAUTION : MAKE CERTAIN THAT BORESCOPE PLUGS ARE CORRECTLY INSTALLED. A MISSING PLUG CAN CAUSE IMPORTANT DAMAGE TO COMPONENTS AND/OR NACELLE STRUCTURE.

(a)For Pre SB PW4ENG 72-675 AP-5 and AP-7 plugs and all AP-2, AP-3, AP-4 and AP-6 plugs : Prior to installing borescope plugs, remove excess baked on compound from threads with a nylon brush. Apply Antiseize Compound (Material No.P06-054) to threads and to plug head washer contact surface area. Wipe off excess compound. Do not use Engine Oil (Material No.P03-001). Run in borescope plug to be sure plug is seated before applying torque by Table 602.

R After you torque the plugs, use the PWA101674 or PWA105181 Mechanical
R Crimper as applicable to bend tabs of the key washer to steps (c)1
R thru (c)6 (Ref. Fig. 623) or
R (Ref. Fig. 624).

CAUTION : DO NOT APPLY ANTISEIZE COMPOUND (MATERIAL No.P06-054) TO THE THREADS AND WASHER FACE OF POST SB PW4ENG 72-765 PLUGS. THESE PLUGS HAVE BAKED ON ANTIGALLING COMPOUND.

(b)For Post SB PW4ENG 72-675 AP-5 and AP-7 plugs : Install plugs into compressor case. Do not use Antiseize Compound (Material No.P06-054) or Engine Oil (Material No.P03-001). Run in borescope plug to be sure plug is seated before applying torque by Table 602 specifications.

(c)(Post SB PW4ENG 72-708 or SB PW4G 72-756) (AP-5 and AP-7) : Install the plugs into the compressor case. Do not use Antiseize Compound (Material No.P06-054) or Engine Oil (Material No.P03-001). Run in the borescope plug to be sure the plug is seated. Torque the plug by Table 601 specifications.After you torque the plug, use the PWA 101674 Mechanical Crimper to bend the tabs of the key washer as follows :

R (Ref. Fig. 624).

1 Put the end of the crimper onto the end of the plug. Turn the crimper so the jaw is under a key washer tab.

2 Squeeze the crimper handle to bend the key washer tab until the tab makes contact with the hex head of the plug.

3 Release the handle and reposition the jaw so that it makes contact again at the base of the tab.

4 Squeeze the crimper handle to final bend the key washer tab until the tab makes contact with the hex head of the plug and maintains less than a 0.020 in. (0.508 mm) gap everywhere between the tab and the hex head of the plug.

5 Crimp all five (5) of the key washer tabs by the same method.

6 All tabs of the key washer must be bent, examine the tabs for the following conditions :

NOTE : Tab washer PN 58H216 uses five tabs as an alternate to two. These additional tabs permit some deviation from the Standard Practices section requirements but it is necessary that all five tabs meet these relaxed requirements. The variations to the Standard Practices section procedure for this key washer are as follows :

a All five tabs must be within 0.020 in. (0.508 mm) maximum of the hex head of the plug. If a tab overlaps two different faces of the hex head the 0.020 in. (0.508 mm) gap requirement must be kept between the tab and whichever face of the hex head that has the larger surface area coverage with the tab. It is good practice to bend the tab against the remaining face.

b It is not necessary that 75 percent of the base of the tab make contact with the hex head of the plug.

c It is not necessary that the key washer tabs be pulled away from the axis of the plug before you torque the plug. This requirement, as stated in the Standard Practices section, is meant for washers that have fewer tabs.

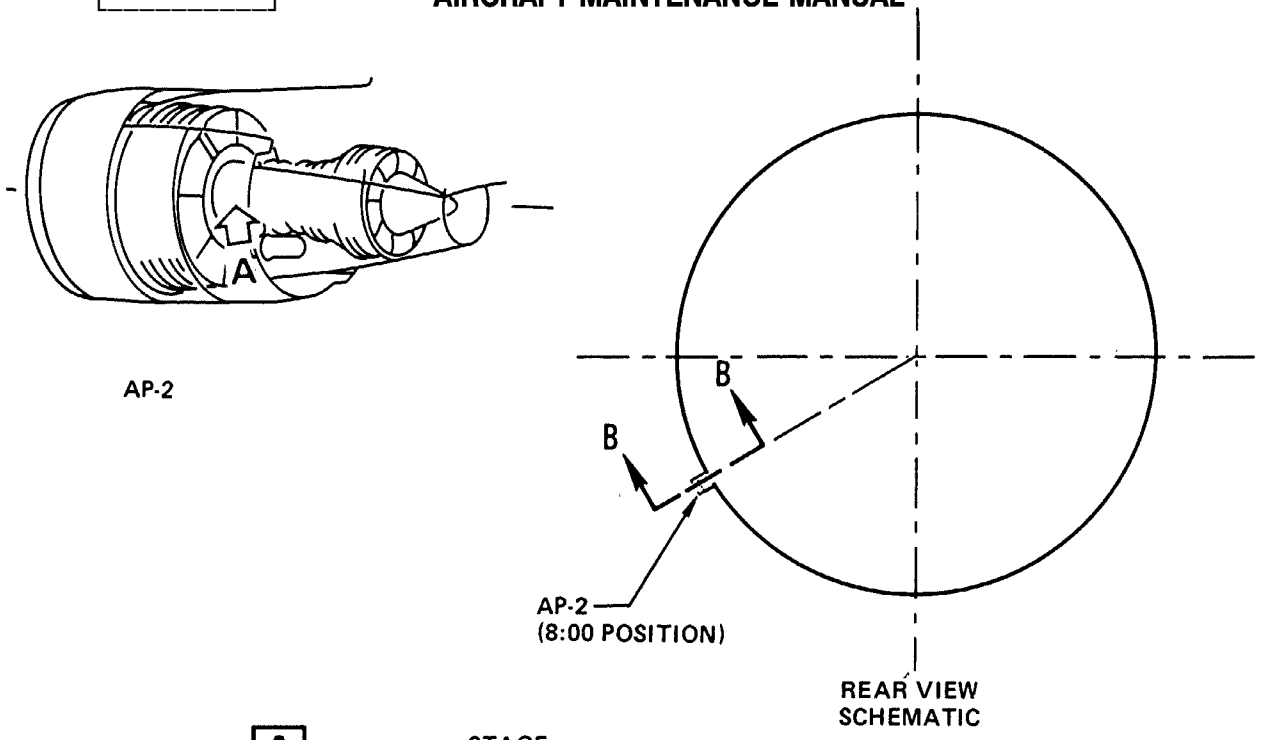
(d)Damaged threaded inserts (AP-2 through AP-7) can be replaced on the HPC rear case borescope access ports (Ref. 72-30-00, P. Block 801).

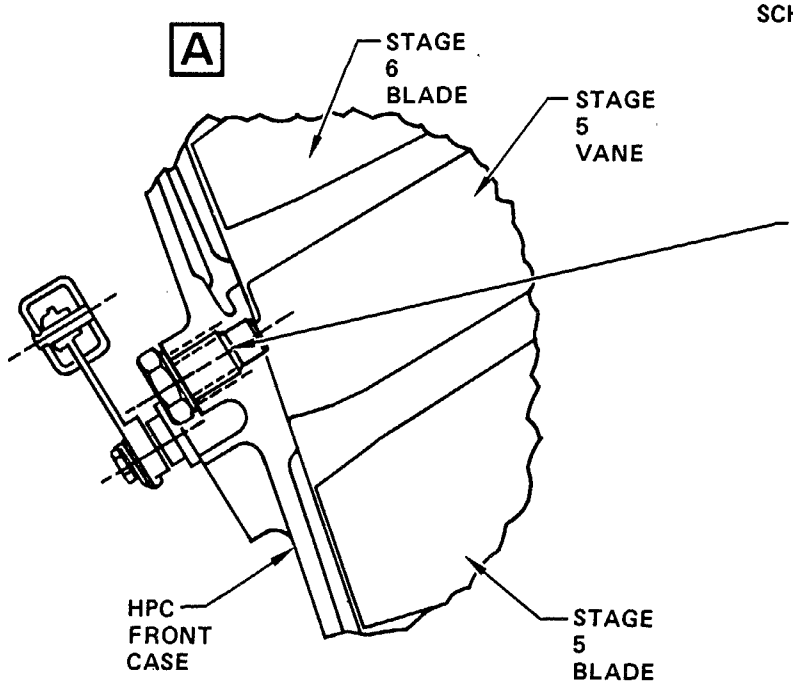
HPC Borescope/Access Plug Installation Data
Table 602

	AP No. and Location	Plug Packing Required	Plug Locking Method	Plug Replacement Lubricant	Plug Torque lbf. in. (m.daN)
	AP-2 Stage 5 Compr. Vane	NO	Self Locking Insert for Earlier Plug, Keywasher (PN53H027) For Later Plug	P06-054 Lubricants (Ref. 70-00-00)	175-190 (1.98-2.15) Reference No. 1554
	AP-3 Stage 6 Compr. Vane	NO	Self Locking Insert for Earlier Plug, Keywasher (PN53H028) For Later Plug	P06-054 Lubricants (Ref. 70-00-00)	175-190 (1.98-2.15) Reference No. 1552
	AP-4 Stage 8 Compr. Vane	NO	Self Locking Insert	P06-054 Lubricants (Ref. 70-00-00)	175-190 (1.98-2.15) Reference No. 1556
	AP-5 Stage 10 Compr. Vane Outer Plug	NO	Key Washer MS9582-19 (Pre SB PW4ENG 72-708) 58H216	P06-054 Lubricants (Ref. 70-00-00)	175-190 (1.98-2.15) Reference No. 1555
R R R	No Inner plug		(Post SB PW4ENG 72-708) (Post SB PW4ENG 72-756)	Do not apply Antiseize Compound or Oil	Reference No. 1554
	Inner Plug	NO	Plug Assy, with Integral Lockwasher (Pre SB PW4ENG	P06-054 Lubricants (Ref. 70-00-00)	175-190 (1.98-2.16) Reference No. 1557

	AP No. and Location	Plug Packing Required	Plug Locking Method	Plug Replacement Lubricant	Plug Torque lbf. in. (m.daN)
			72-675)		
	Inner Plug	NO	Plug Assy, with Integral Lockwasher (Post SB PW4ENG 72-675)	DO NOT APPLY ANY LUBRICANT (This plug has baked on anti-galling compound)	175-190 (1.98-2.14) Reference No. 1557
	AP-6 Stage 12 Compr. Vane	NO	Self Locking Insert	P06-054 Lubricants (Ref. 70-00-00)	175-190 (1.98-2.15) Reference No. 1556
	AP-7 Stage 14 Compr. Vane Outer Plug	NO	Key Washer MS9582-19 (Pre SB PW4ENG 72-708)	P06-054 Lubricants (Ref. 70-00-00)	175-190 (1.98-2.15) Reference No. 1555
R R R	No Inner plug		58H216 (Post SB PW4ENG 72-708) (Post SB PW4ENG 72-756)	Do not apply Antiseize Compound or Oil	Reference No. 1554
	Inner Plug	NO	Self Locking Insert (Pre SB PW4ENG 72-675)	P06-054 Lubricants (Ref. 70-00-00)	175-190 (1.98-2.15) Reference No. 1559
	Inner Plug	NO	Plug Assy, with Integral Lockwasher (Post SB PW4ENG 72-675)	DO NOT APPLY ANY LUBRICANT (This plug has baked on anti-galling compound)	175-190 (1.98-2.14) Reference No. 1559

D. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close fan and thrust reverser cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).





SECTION B–B

L–A1101

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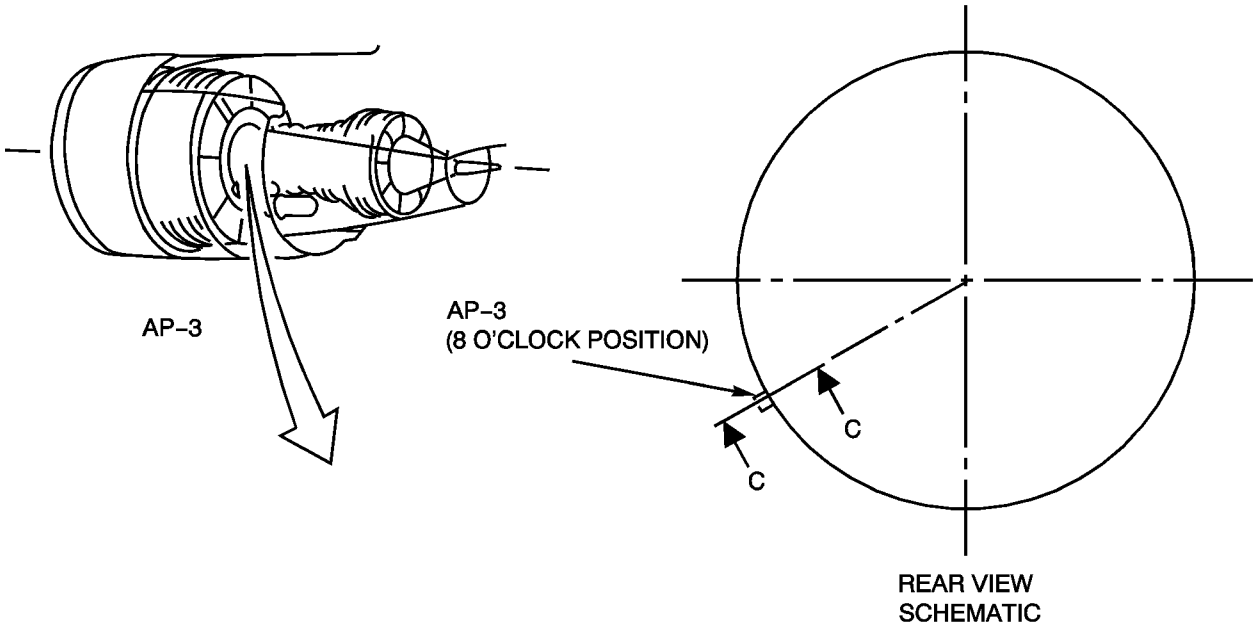
HPC Borescope Access Port AP-2
Figure 613



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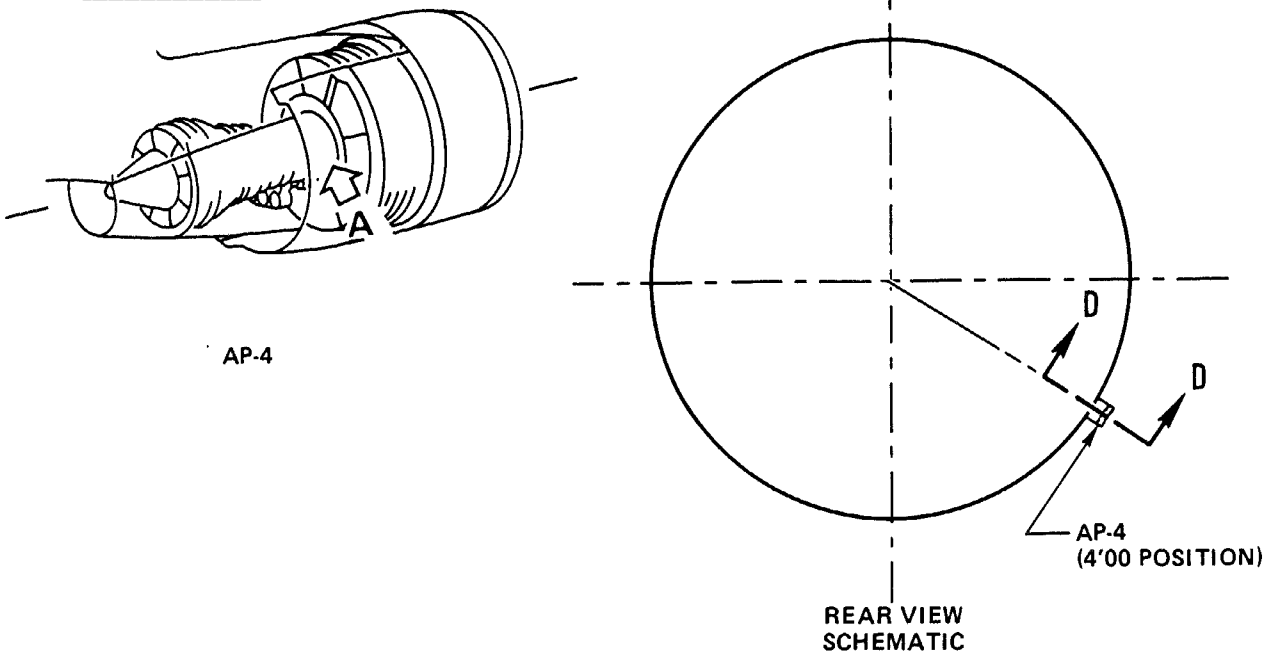
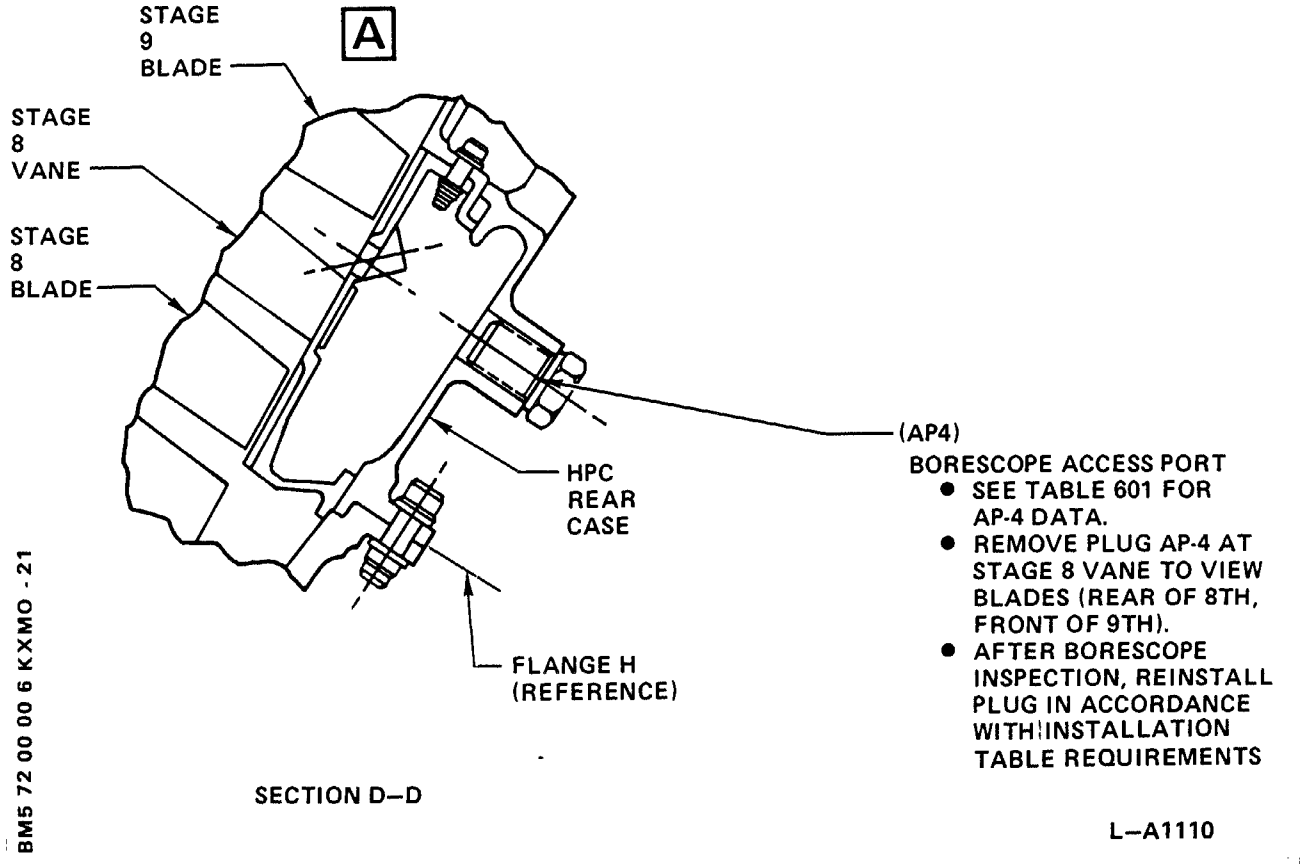
PW V

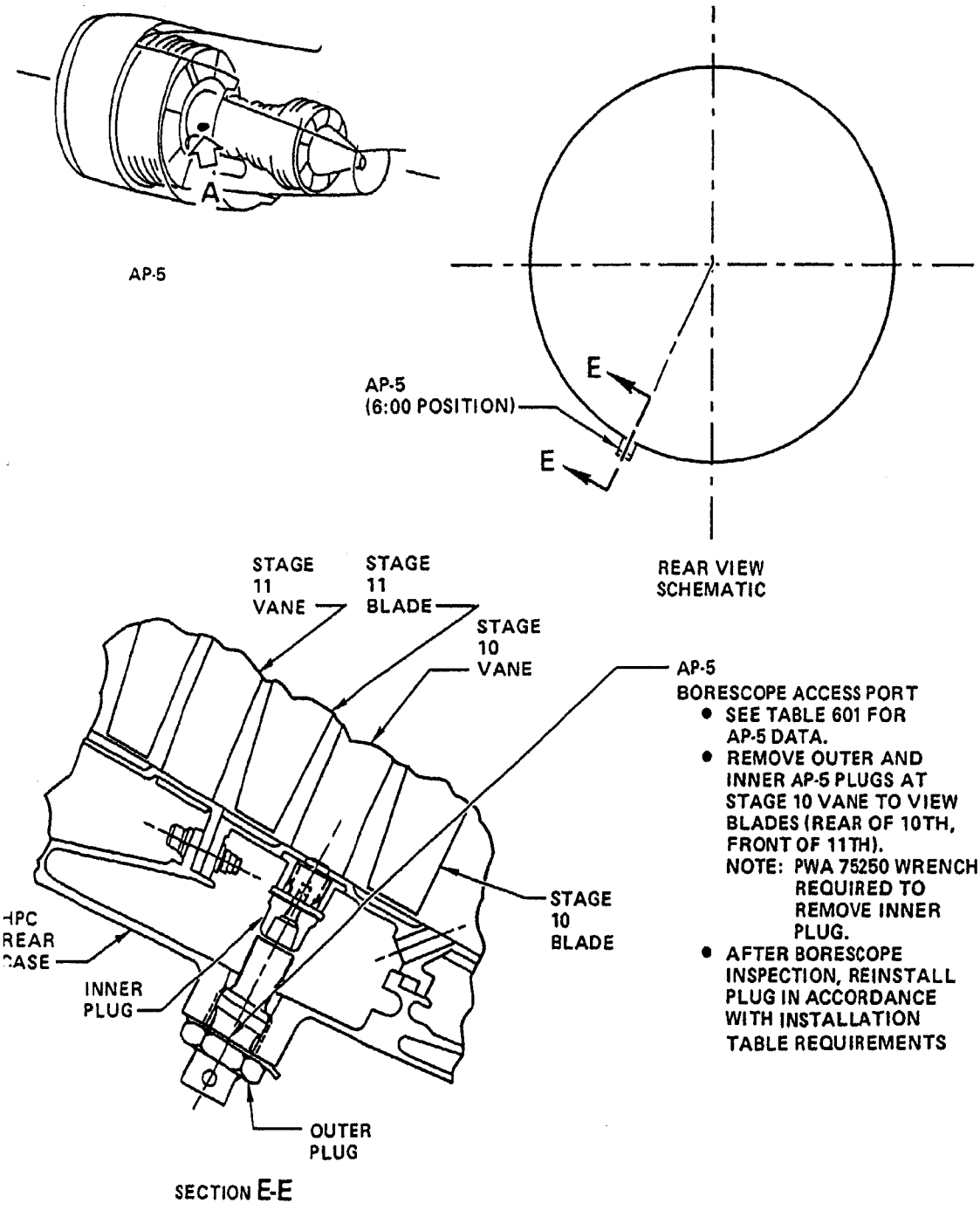
R

HPC Borescope Access Port AP-3
Figure 614





HPC Borescope Access Port AP-4
Figure 615



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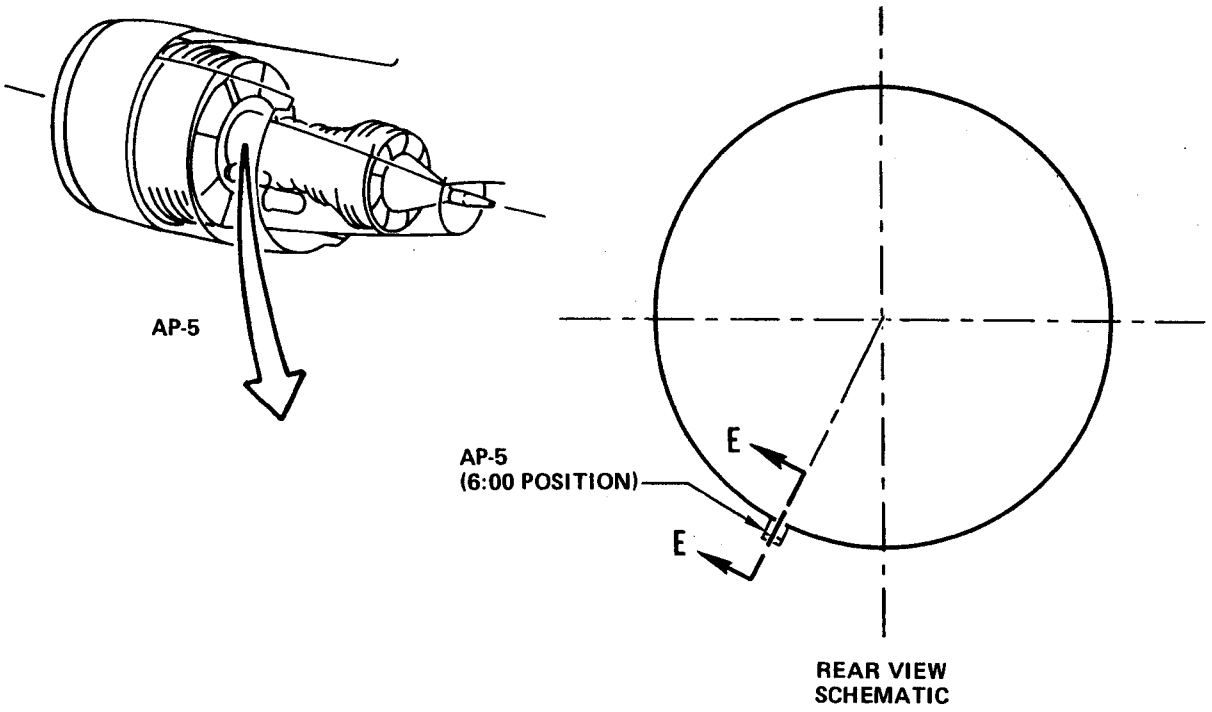
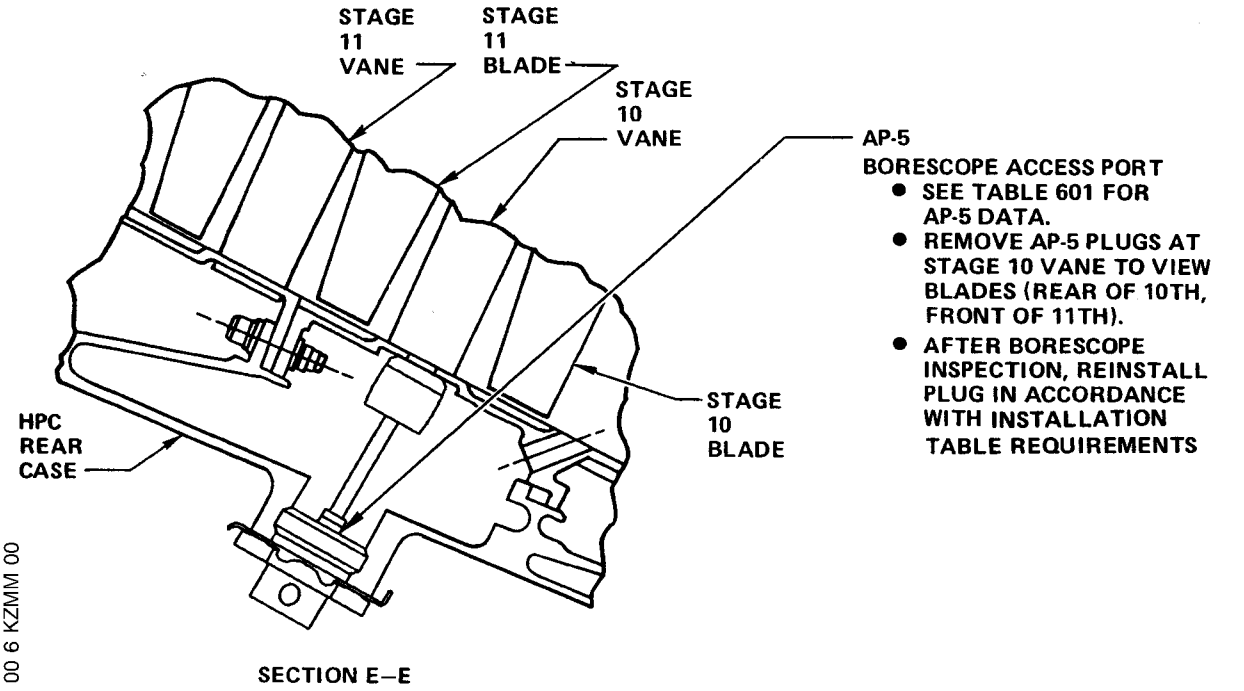
HPC Borescope Access Port AP-5 (Sheet 1/2)
Figure 616





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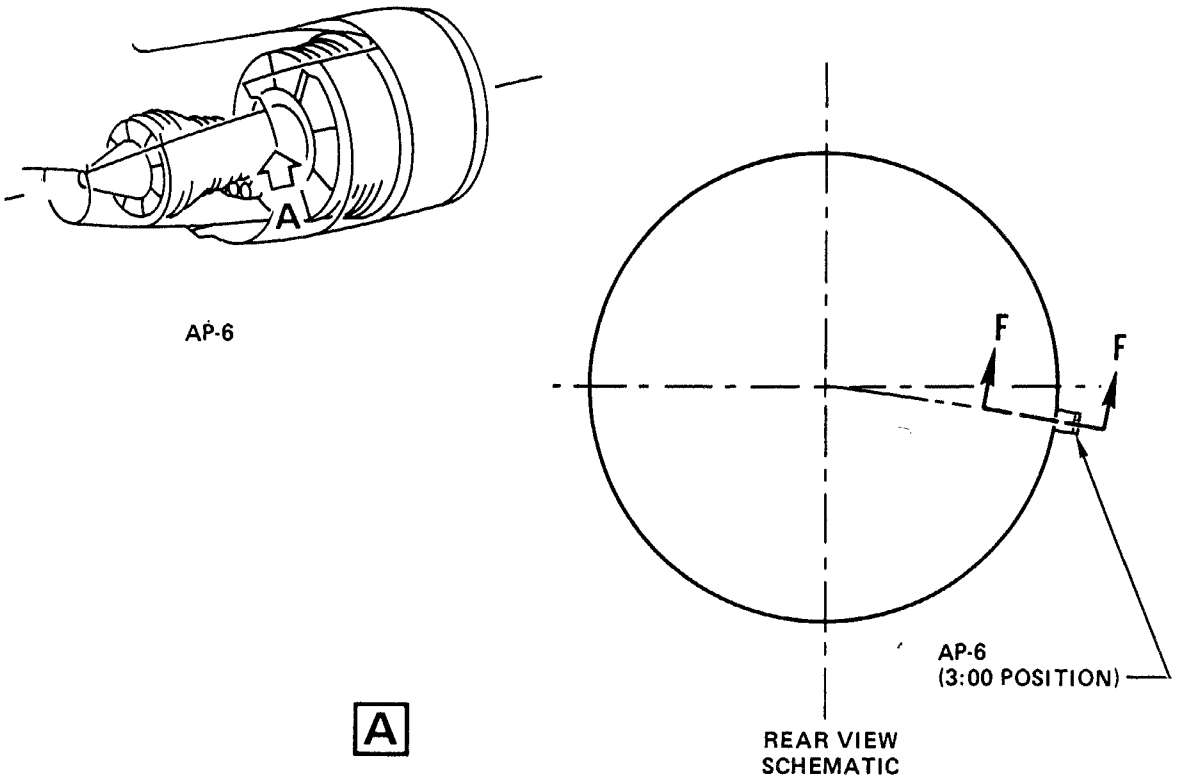
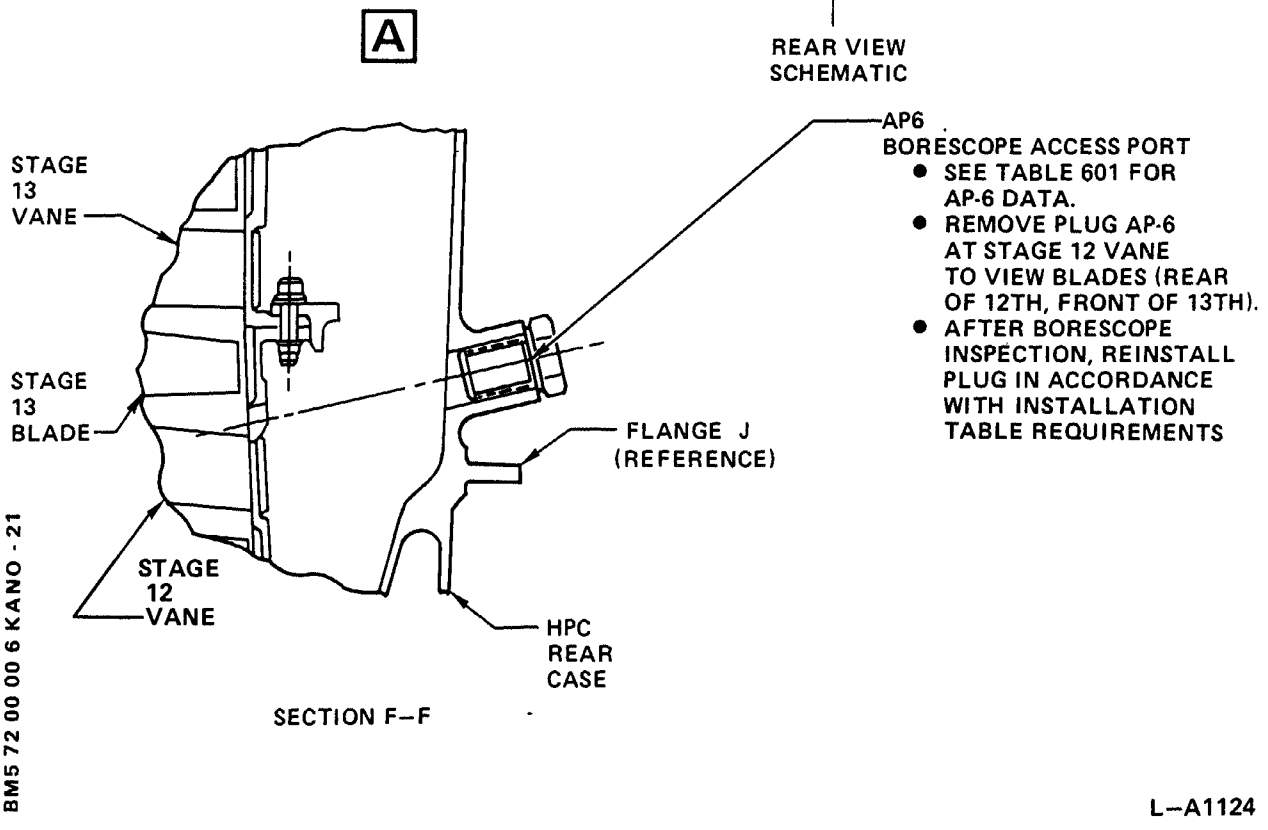
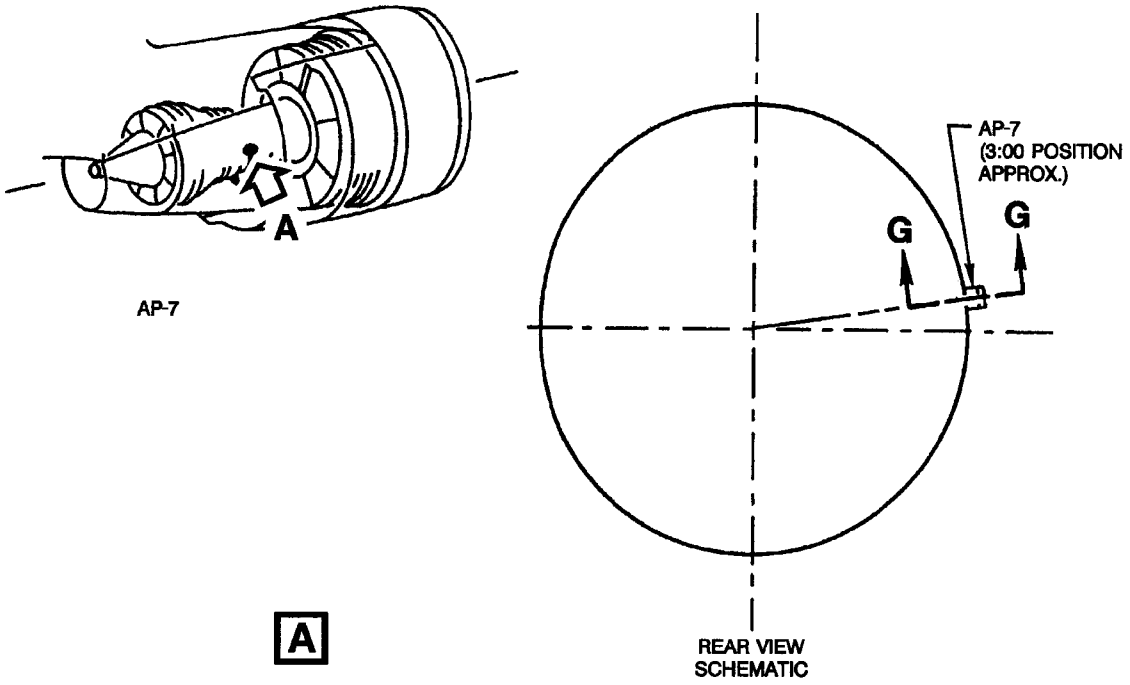
HPC Borescope Access Port AP-5
Post SB PW4ENG 72-756 (Sheet 2/2)
Figure 616



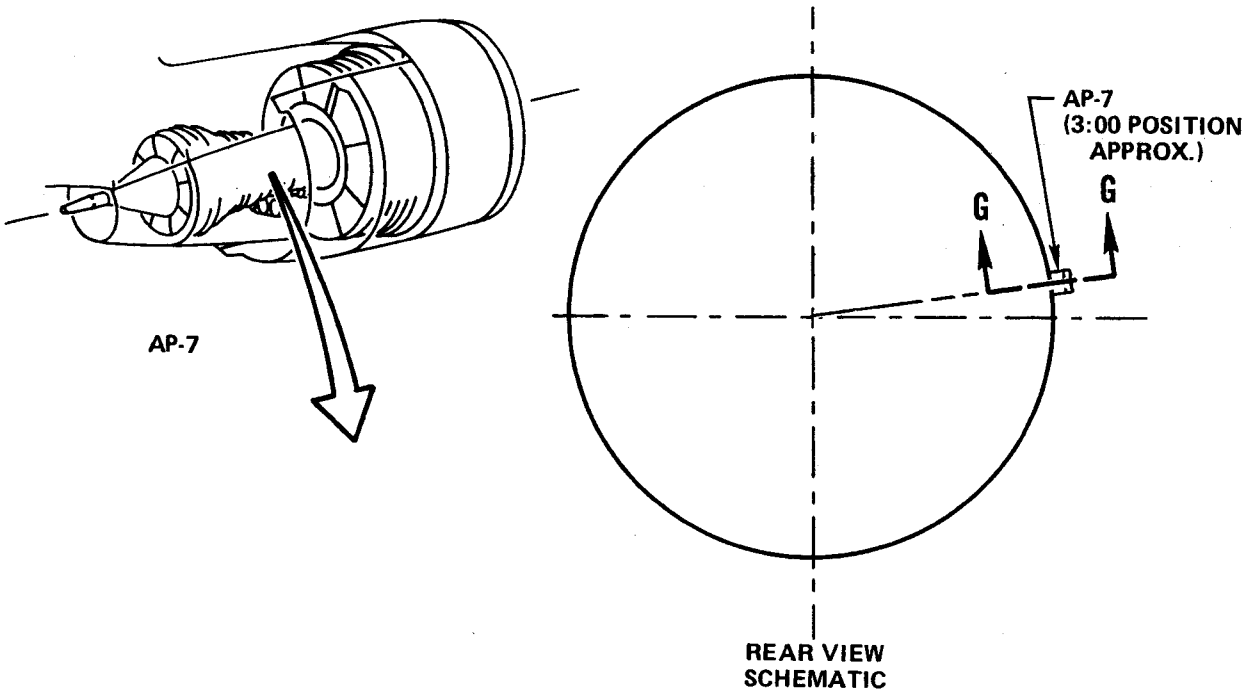


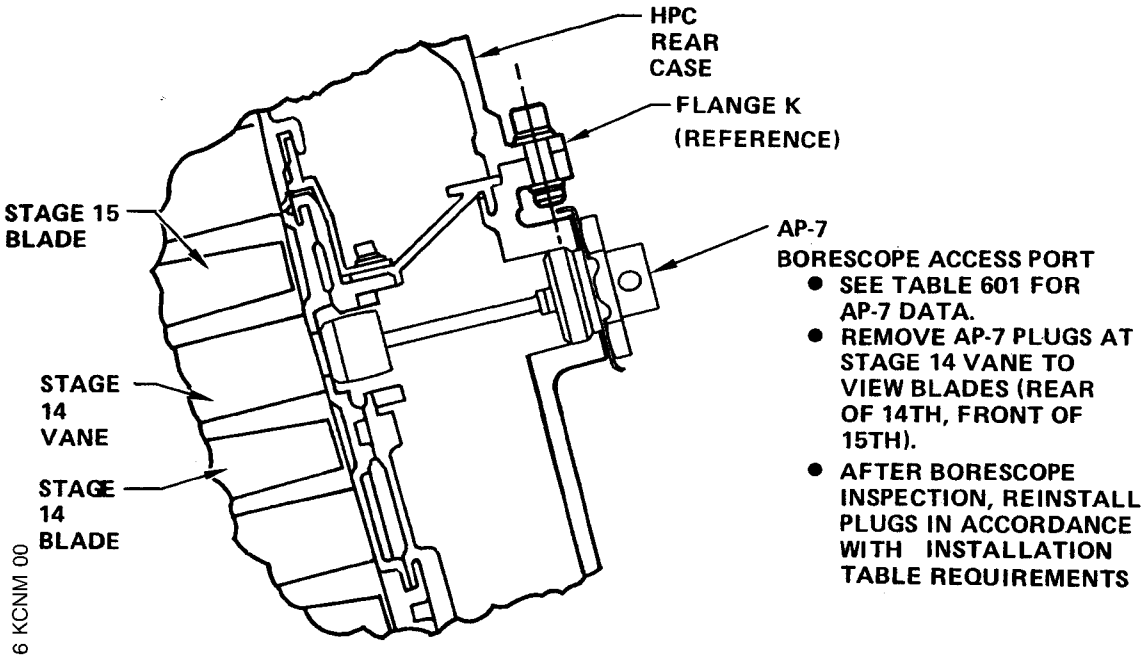
HPC Borescope Access Port AP-6
Figure 617



BM5 72 00 00 6 KCNA 00

HPC Borescope Access Port AP-7 (Sheet 1/2)
Figure 618



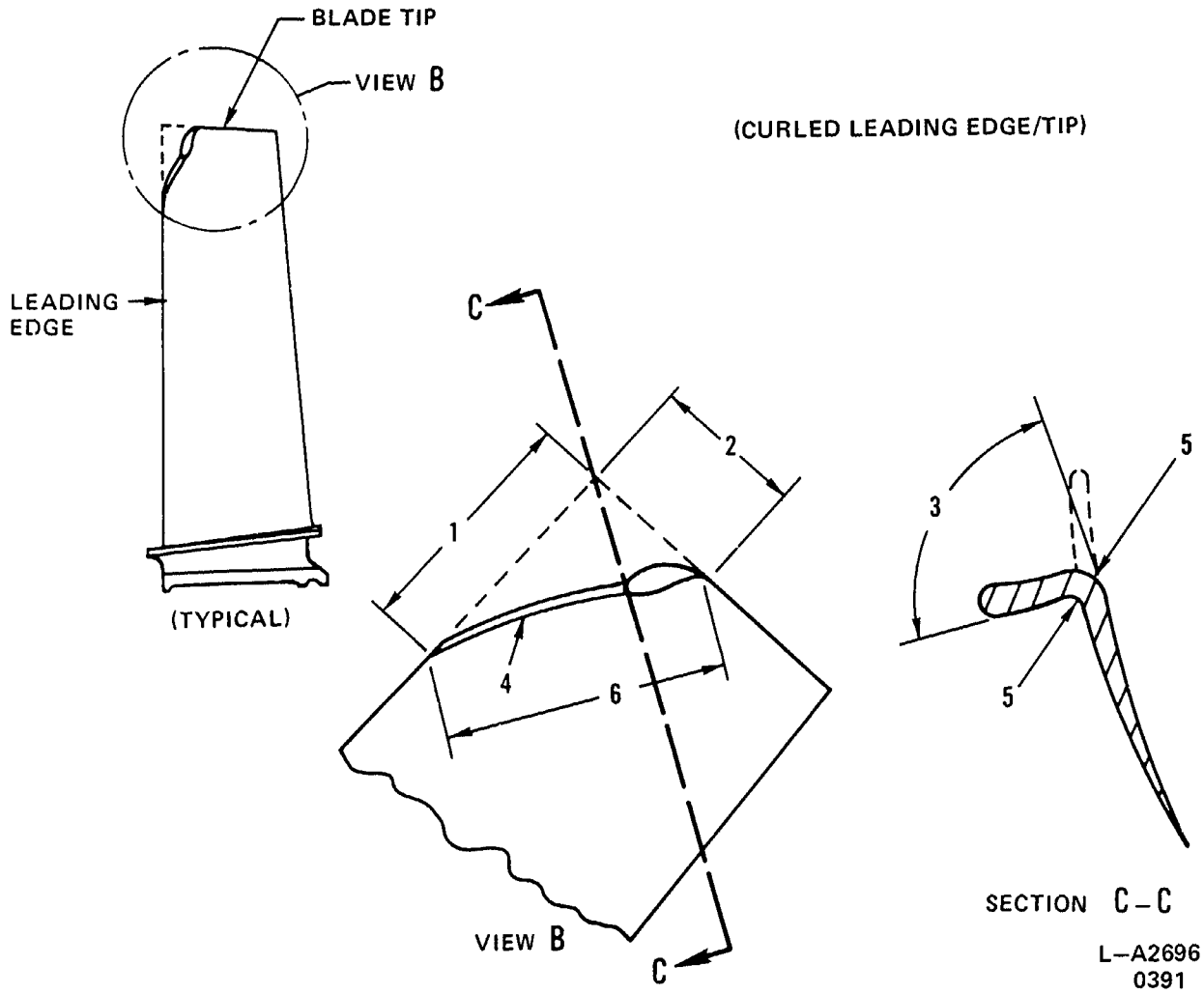


- SEE TABLE 601 FOR AP-7 DATA.
- REMOVE AP-7 PLUGS AT STAGE 14 VANE TO VIEW BLADES (REAR OF 14TH, FRONT OF 15TH).
- AFTER BORESCOPE INSPECTION, REINSTALL PLUGS IN ACCORDANCE WITH INSTALLATION TABLE REQUIREMENTS

L-D0693 (0103)

BM5 72 00 00 6 KCNM 00

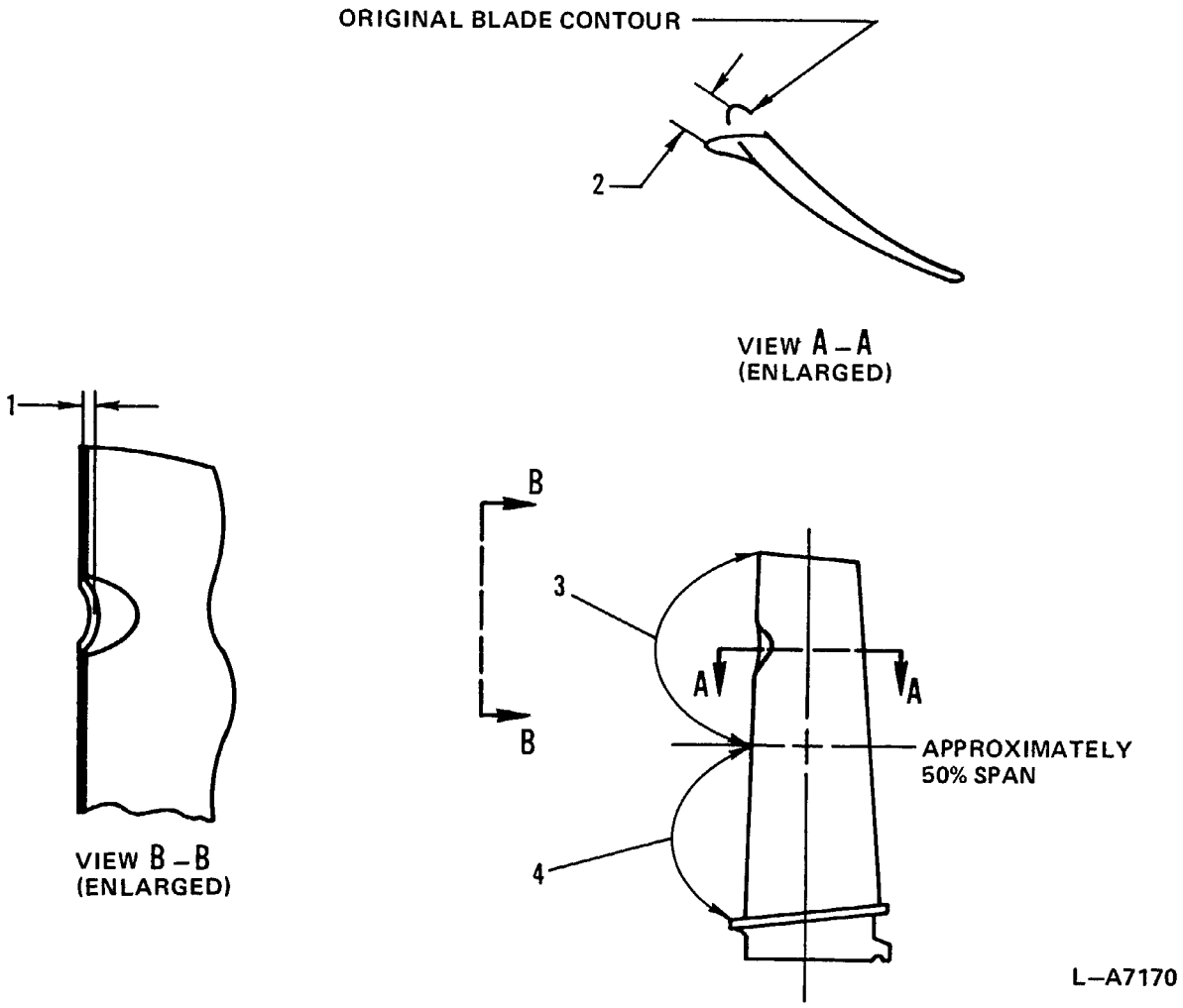
HPC Borescope Access Port AP-7
Post SB PW4ENG 72-756 (Sheet 2/2)
Figure 618



BMS 72 00 00 6 KENA - 00

1 . 0.500 IN (12.700 MM) MAXIMUM STAGE 5 THRU 7
2 . 0.250 IN (6.350 MM) MAXIMUM STAGE 5 THRU 7
3 . 90° MAXIMUM
4 . LEADING EDGE SHOULD BE SMOOTH AND CONTINUOUS
5 . NO DENTS, GOUGES , CRACKS OR SCRATCHES PERMITTED ON BEND RADII FOR LENGTH OF BEND (INDEX 6)
6 . LENGTH OF BEND

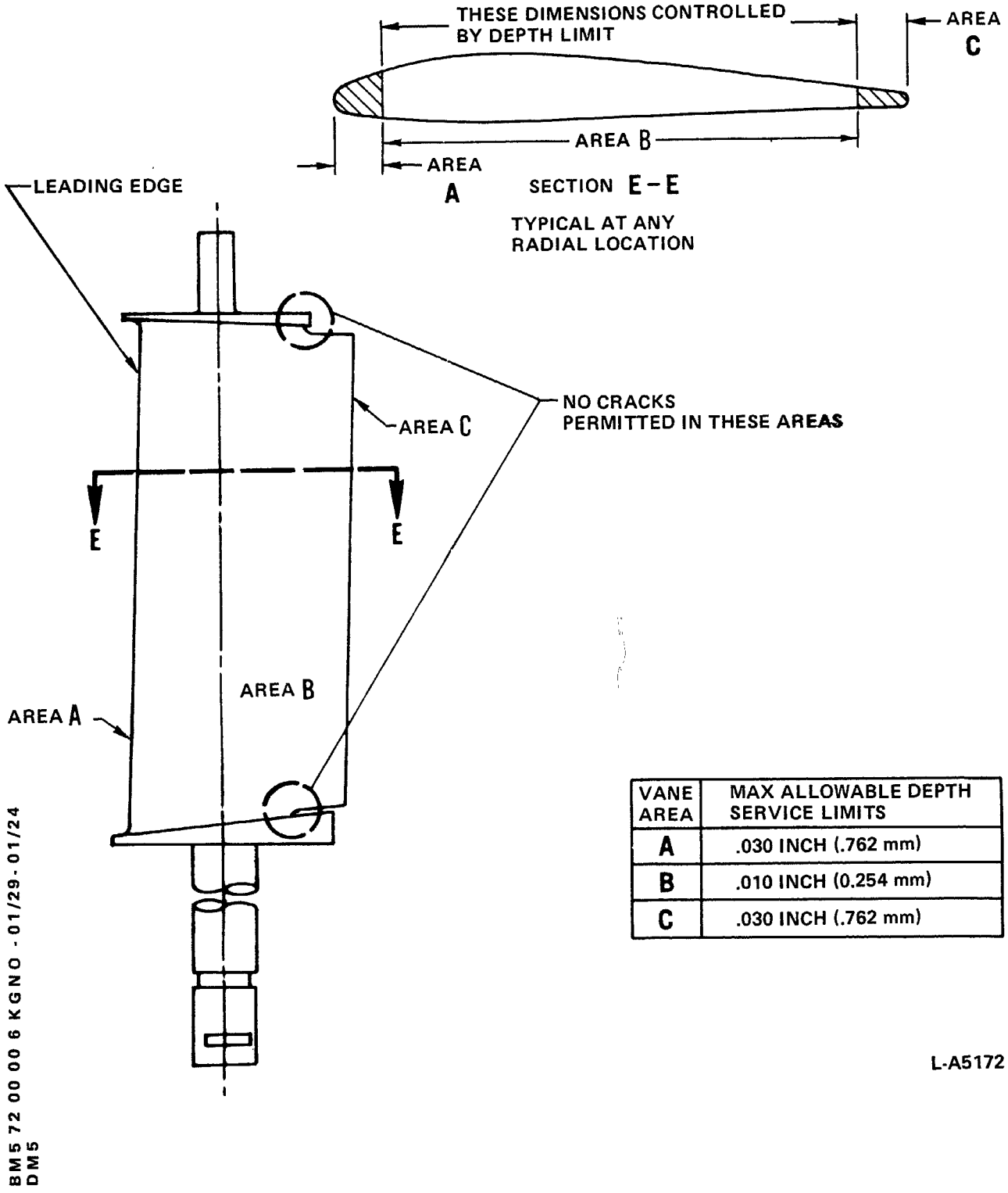
HPC Stages 5 thru 7 Blade Leading Edge/Blade Tip Curl Limits (Sheet 1/2)
Figure 619



1 . HPC STAGE 5 BLADES 0.045 IN.(1.143 MM) MAXIMUM
HPC STAGE 6 AND 7 BLADES 0.030 IN (0.762 MM) MAXIMUM
2 . MAXIMUM DEVIATION IN ANY DIRECTION FROM ORIGINAL BLADE CONTOUR
- HPC STAGE 5 BLADES 0. 045 IN. (1. 43 MM)
- HPC STAGE 6 AND 7 BLADES 0. 030 IN. (0.762 MM)
3 . BENDING IS PERMITTED AS SHOWN
4 . NO BENDING IS PERMITTED

BM5 72 00 00 6 KENC - 00

HPC Stages 5 thru 7 Blade Leading Edge/Blade
Tip Curl Limits (Sheet 2/2)
Figure 619

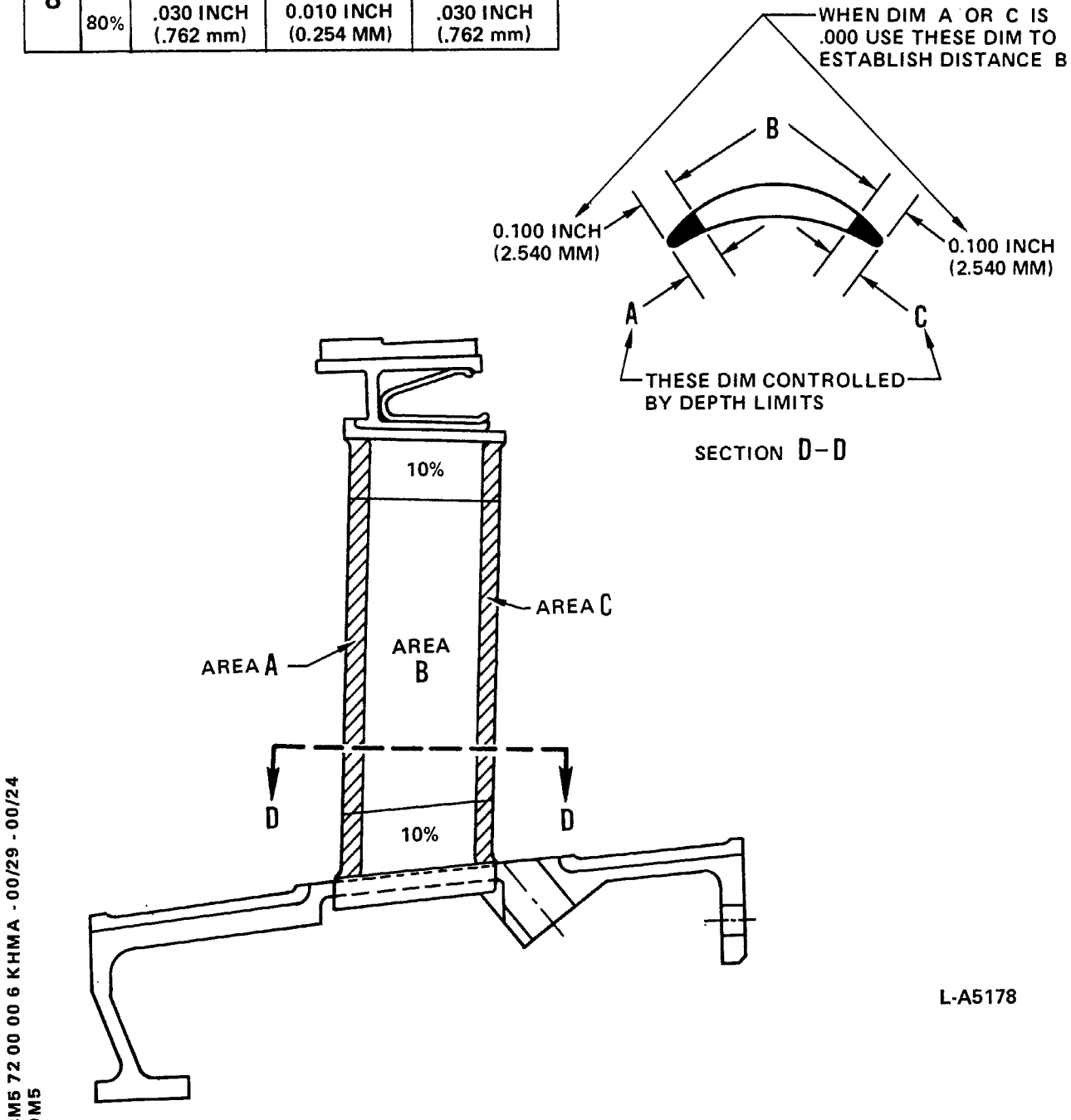


VANE AREA	MAX ALLOWABLE DEPTH SERVICE LIMITS
A	.030 INCH (.762 mm)
B	.010 INCH (0.254 mm)
C	.030 INCH (.762 mm)

L-A5172

HPC Vane Nick Limits (Stages IGV Through-7)
Figure 620

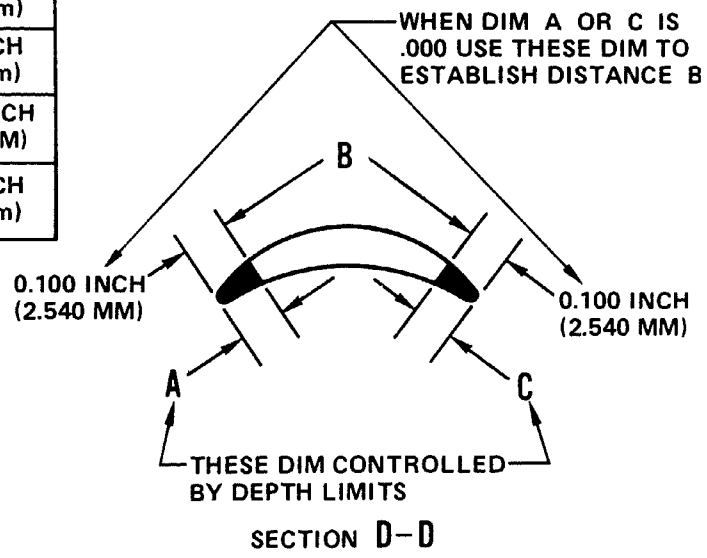
VANE AREA		MAX DEPTH SERVICE LIMIT		
		A	B	C
8	10%	0.000 INCH (0.000 MM)	0.010 INCH (0.254 MM)	0.000 INCH (0.000 MM)
	80%	.030 INCH (.762 mm)	0.010 INCH (0.254 MM)	.030 INCH (.762 mm)



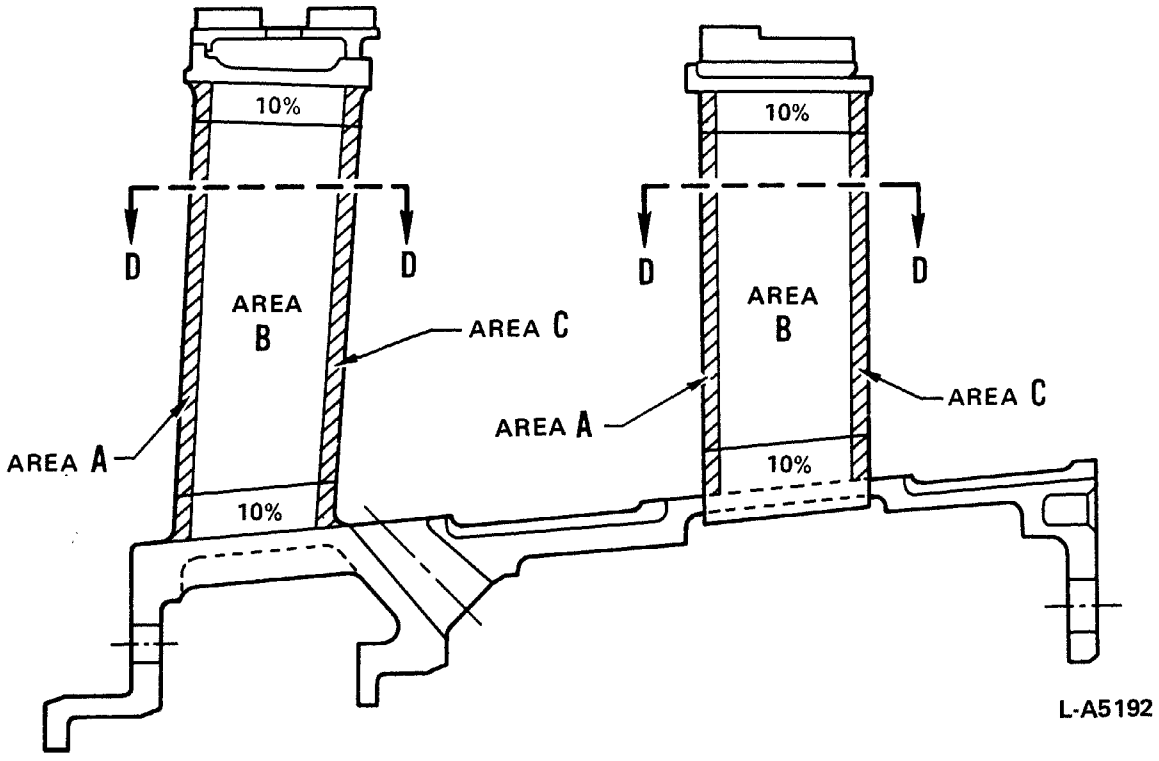
BM5 72 00 00 6 KHMA -00/29 -00/24
DM5

HPC Vane Nick Limits (Stage 8) (Sheet 1/5)
Figure 621

VANE AREA		MAX DEPTH SERVICE LIMIT		
		A	B	C
9	10%	.030 INCH (.762 mm)	0.000 INCH (0.000 MM)	.030 INCH (.762 mm)
	80%	.030 INCH (.762 mm)	0.000 INCH (0.000 MM)	.030 INCH (.762 mm)
10	10%	0.000 INCH (0.000 MM)	0.010 INCH (0.254 MM)	0.000 INCH (0.000 MM)
	80%	.030 INCH (.762 mm)	0.010 INCH (0.254 MM)	.030 INCH (.762 mm)


WHEN DIM A OR C IS .000 USE THESE DIM TO ESTABLISH DISTANCE B
B
0.100 INCH (2.540 MM)
0.100 INCH (2.540 MM)
A
C
THESE DIM CONTROLLED BY DEPTH LIMITS

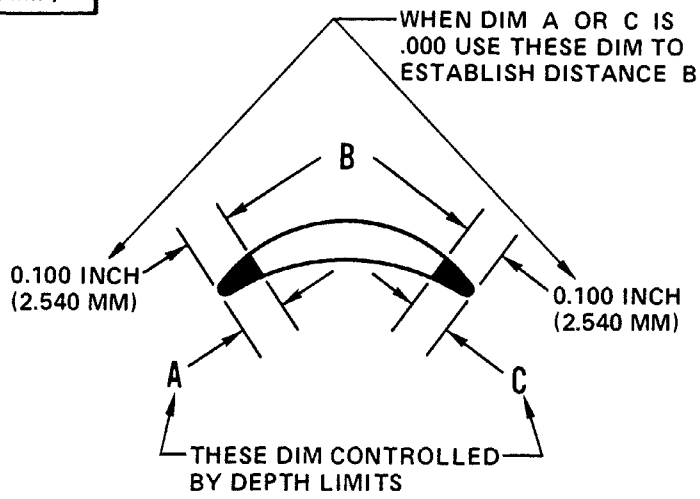
SECTION D-D



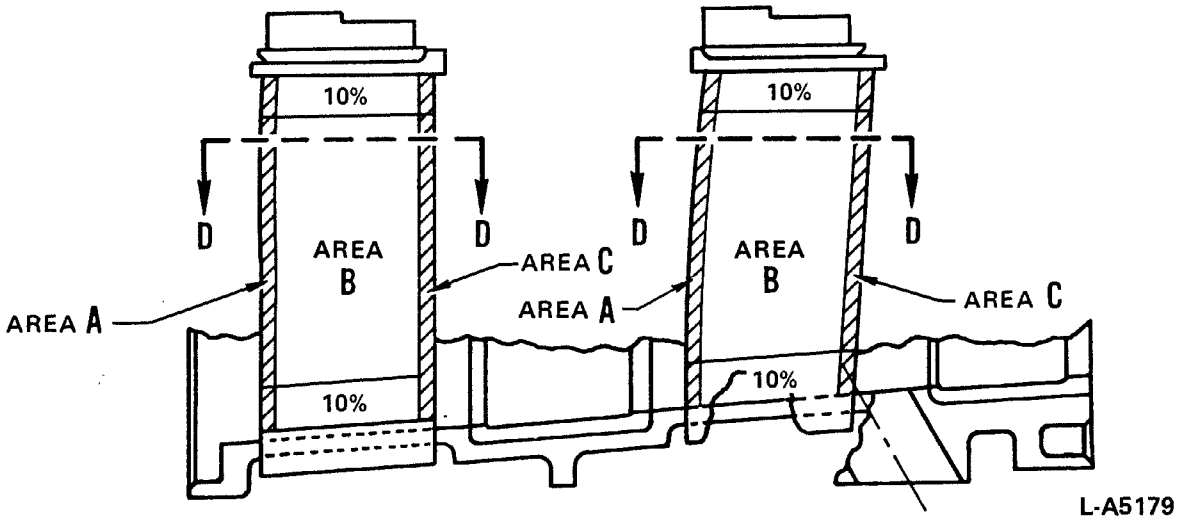
BM5 72 00 00 6 KHMB - 00/29 - 00/24
DM5

HPC Vane Nick Limits (Stages 9 and 10) (Sheet 2/5)
Figure 621

VANE AREA		MAX DEPTH SERVICE LIMIT		
		A	B	C
11/12	10%	0.000 INCH (0.000 MM)	0.010 INCH (0.254 MM)	0.000 INCH (0.000 MM)
	80%	.030 INCH (.762 mm)	0.010 INCH (0.254 MM)	.030 INCH (.762 mm)


WHEN DIM A OR C IS .000 USE THESE DIM TO ESTABLISH DISTANCE B
B
0.100 INCH (2.540 MM)
0.100 INCH (2.540 MM)
A
C
THESE DIM CONTROLLED BY DEPTH LIMITS

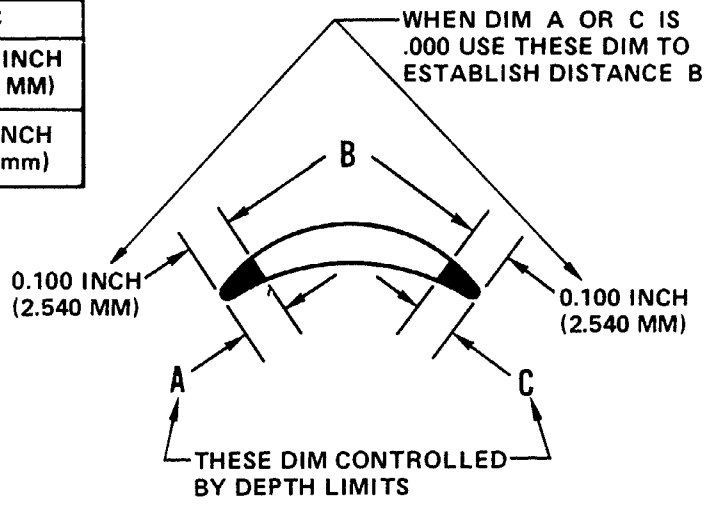
SECTION D-D



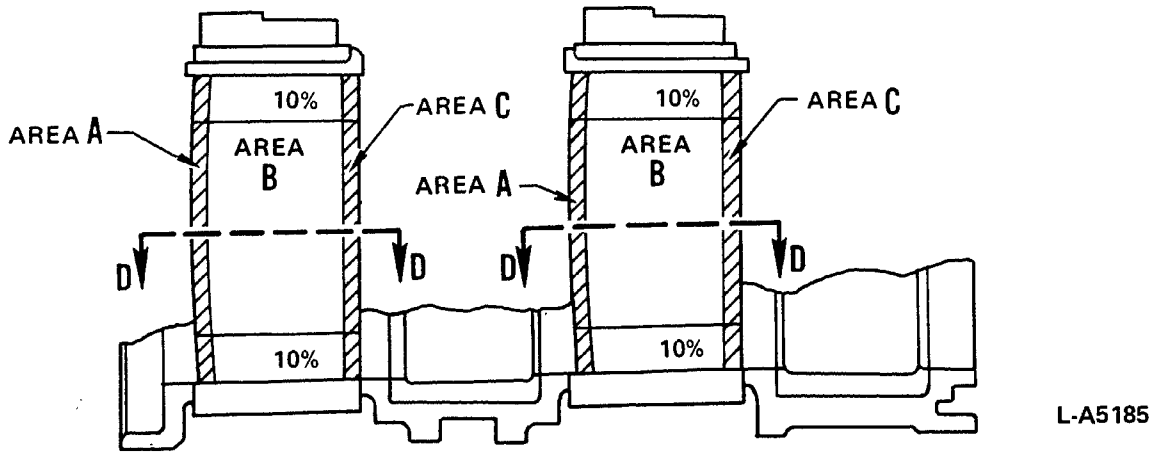
BM5 72 00 00 6 KHMC - 00/29 - 00/24
DM5

HPC Vane Nick Limits (Stages 11 and 12) (Sheet 3/5)
Figure 621

VANE AREA		MAX DEPTH SERVICE LIMIT		
		A	B	C
13/14	10%	0.000 INCH (0.000 MM)	0.010 INCH (0.254 MM)	0.000 INCH (0.000 MM)
	80%	.030 INCH (.762 mm)	0.010 INCH (0.254 MM)	.030 INCH (.762 mm)


WHEN DIM A OR C IS .000 USE THESE DIM TO ESTABLISH DISTANCE B
B
0.100 INCH (2.540 MM)
0.100 INCH (2.540 MM)
A
C
THESE DIM CONTROLLED BY DEPTH LIMITS

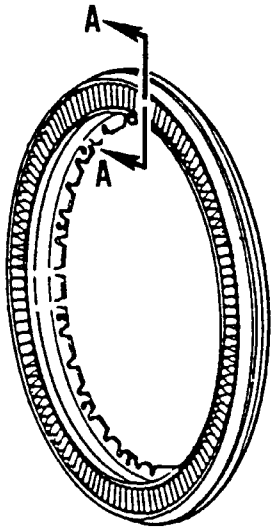
SECTION D-D

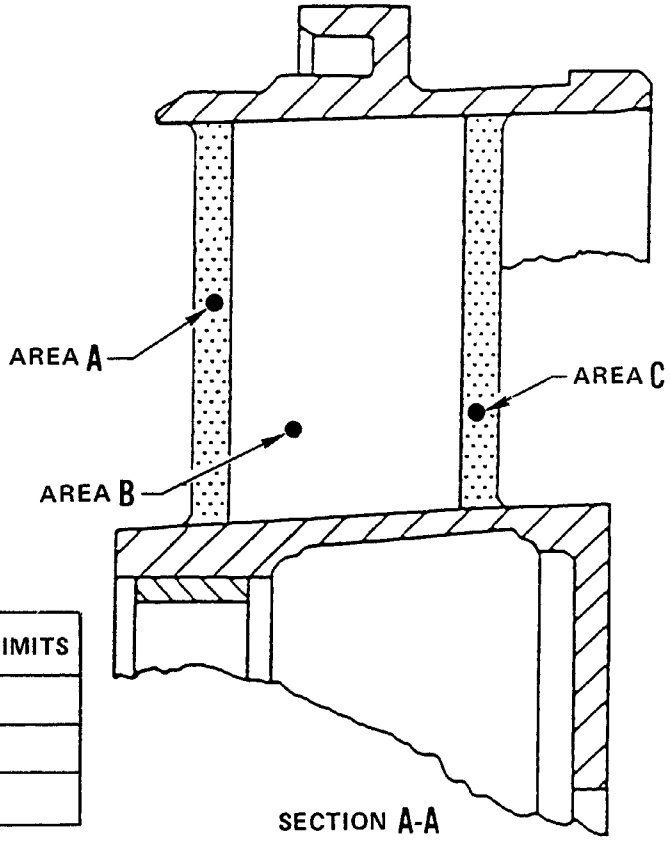


L-A5185

BM5 72 00 00 6 KHMD - 00/29 - 00/24
DM5

HPC Vane Nick Limits (Stages 13 and 14) (Sheet 4/5)
Figure 621



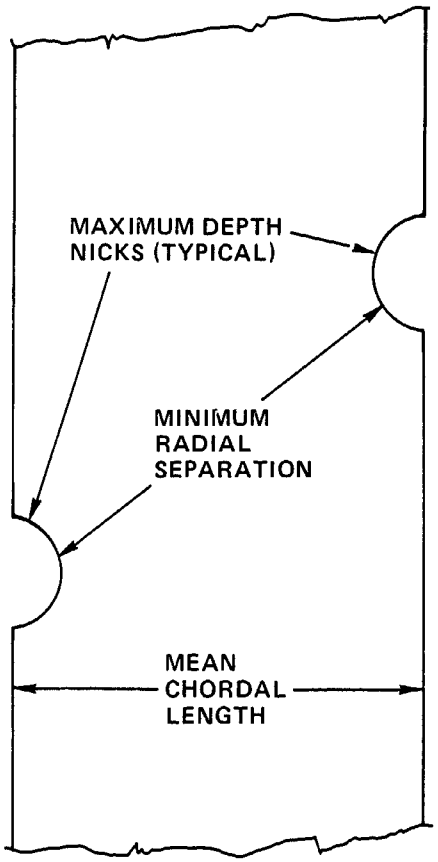


VANE AREA	MAX DEPTH SERVICE LIMITS
A	.030 INCH (.762 mm)
B	.010 INCH (.254 mm)
C	.030 INCH (.762 mm)

L-A5199
0790

BM5 72 00 00 6 KHME - 01

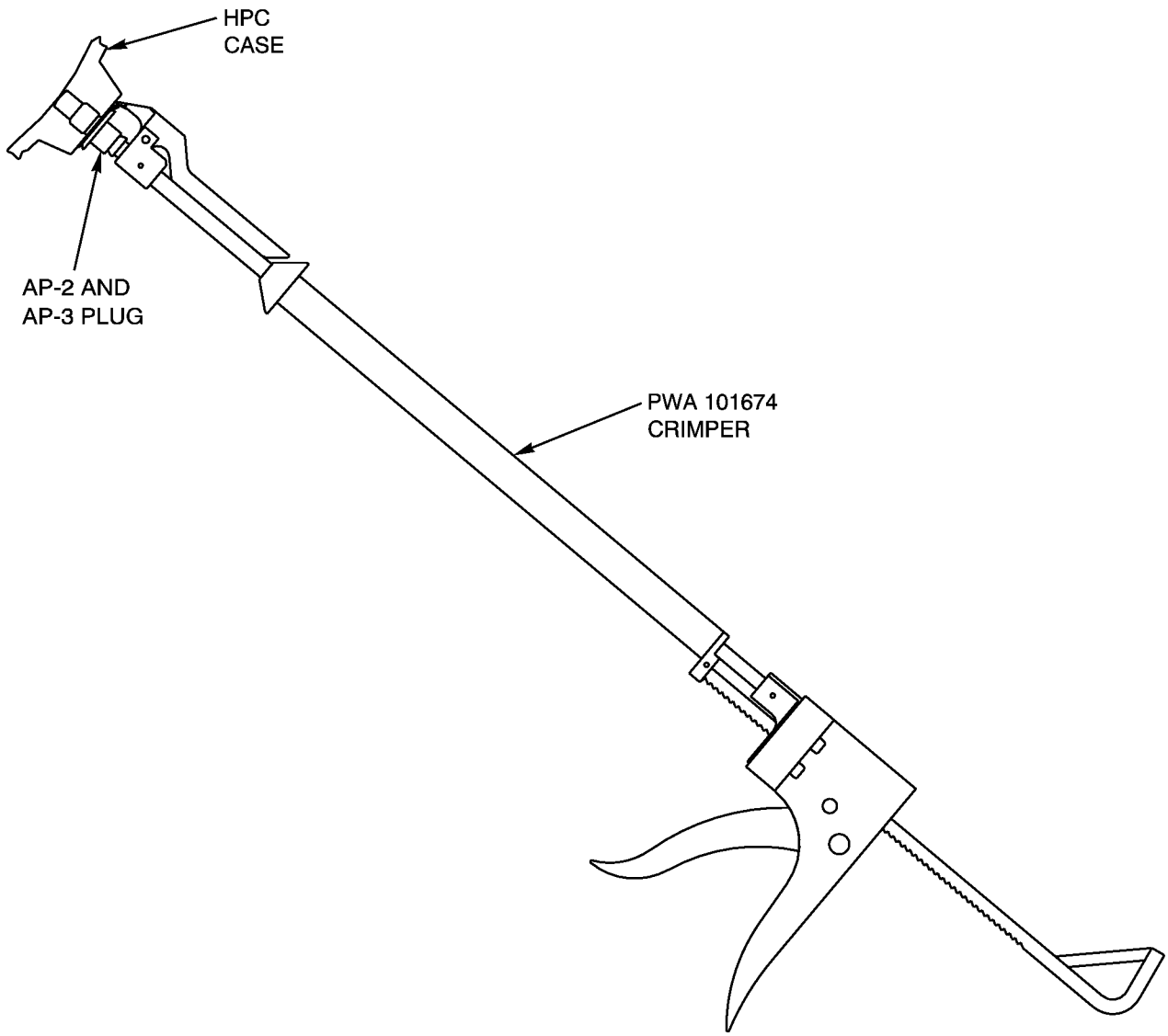
HPC Vane Nick Limits/Stages 15 Exit Stator/Sheet 5/5)
Figure 621



BM5 72 00 00 6 KLNO - 19

L-A1135

Proximity of Nicks Between Vane Leading and Trailing Edges
Figure 622

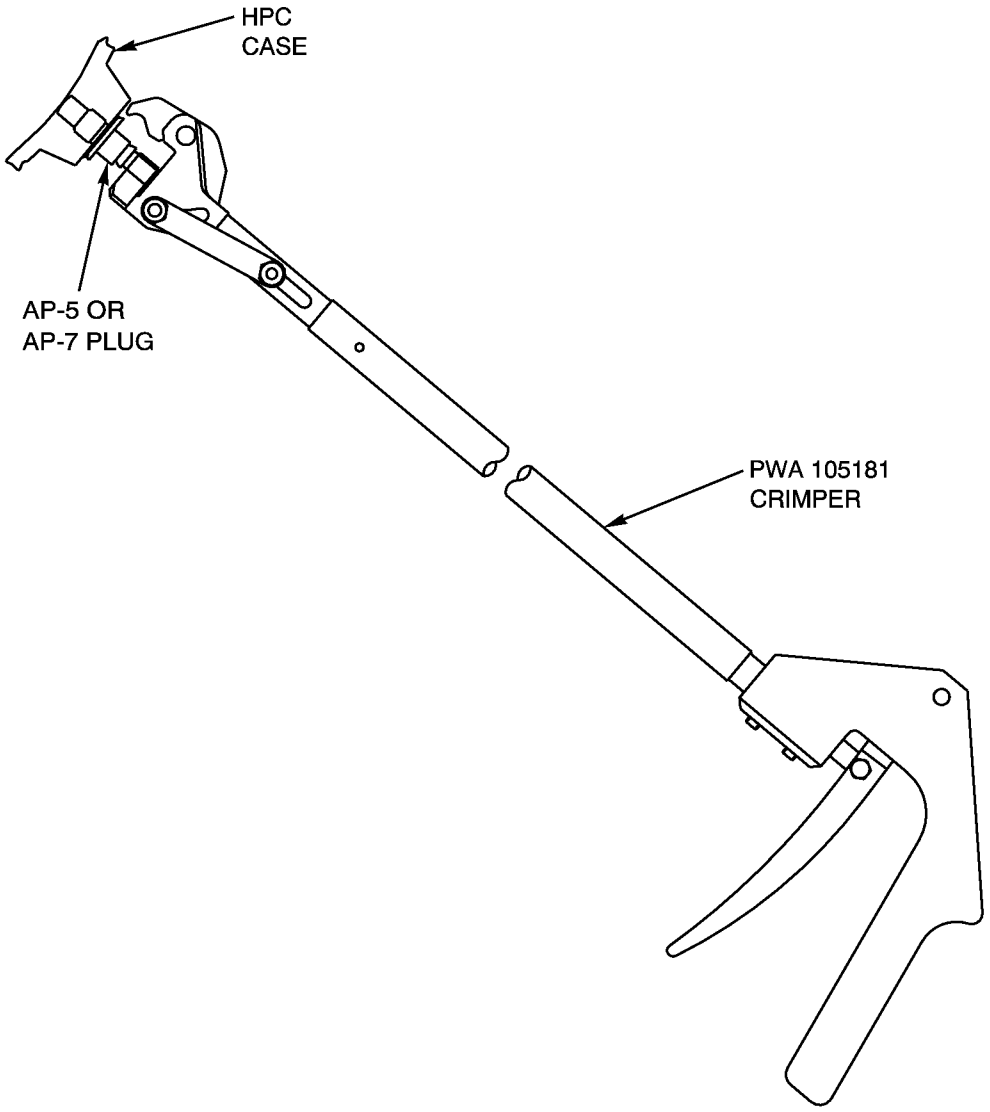


BM5 72 00 00 6 KBM0 01

L-D3534 (1209)
PW V

PWA101674 Mechanical Crimper (AP-2, AP-3)
Figure 623

R



L-D4503 (0110)
PW V

BM5 72 00 00 6 KBN0 00

PWA105181 Mechanical Crimper (AP-5, AP-7)
Figure 624

R

4. Perform Borescope Inspection of Combustion Chamber Area (AP-8, AP-9)
(Ref. Fig. 625, 626, 627)
(Ref. Fig. 628, 629, 630)
(Ref. Fig. 631, 632, 633)
(Ref. Fig. 634, 635, 636)
(Ref. Fig. 637, 638, 639)
(Ref. Fig. 640, 641)

A. Equipment And Materials

ITEM	DESIGNATION
(1)Material No.P06-023	Lubricants (Ref. 70-00-00)
(2)	Gasket
(3)	Corrosion Resistant Steel Lockwire (Ref. 70-00-00)

B. General
(1)To ensure consistency and to eliminate confusion in reports or inspection standards, use nomenclature for various components of the inner and outer combustion chamber assembly as shown in Figs (Ref. Fig. 625, 626, 627) (Ref. Fig. 629).
(2)As an aid to documenting and maintaining inspection records, (Ref. Fig. 631, 632, 633) are included. Copies may be made and used for documenting inner and outer combustion chamber assembly distress for ready reference and communications.

C. Definition of Terms
(1)Following terms are used in describing inner and outer combustion chamber assembly borescope distress and related limits.
(a)Burned or missing material - an area in which a louver is discolored, distorted, or louver lip material is missing as a result of burning.
(b)Burn streak - an axial series of louvers exhibiting burning and missing material.
(c)Hole - an area in which complete penetration of combustion chamber wall has resulted from material being burned away. Holes normally appear in burn streak.
(d)(Ref. Fig. 625, 626, 627) for definition of terms axial, radial, and circumferential for inner and outer combustion chamber assemblies.

D. Inner and Outer Combustion Chamber Assembly Limits
(1)Borescope inspection limits are presented in tabular form, including all items for distress interpretation.
(2)Distress limits in the following Table 603 are based upon considerations of inner and outer combustion chamber assembly durability and component integrity only. If inner and outer chamber assemblies are allowed to distress to absolute maximum levels of reduced inspection intervals, part repairability could be affected. This data consists of deterioration and damage limits as follows :
(a)The inner and/or outer combustion chamber assembly is acceptable for continued service but with regular borescope inspection interval.

(b)The inner and/or outer combustion chamber assembly is acceptable for continued service but with a reduced borescope inspection interval. Chambers which have reached a level of distress exceeding regular inspection interval limits may be continued in service by employing this reduced inspection interval, until distress level reaches one or more of conditions listed under this category.

(c)The inner and/or outer combustion chamber assembly should be replaced, with service use terminated. Combustion chamber assemblies exhibiting distress exceeding reduced inspection interval limits must be removed from service. Engines in this category may be operated for a maximum of five additional cycles in order to reach a repair facility.
It is expected that if distress exceeds these limits, discretionary judgement will be exercised in continuing engine operation for the additional five cycles.

(d)Limits and conditions pertaining to the inner and outer combustion chamber assembly are addressed in Table 603.

E. Procedure

(1)Remove plugs and gaskets from the six AP-8 borescope access ports located on the diffuser case assembly (Ref. Fig. 601, 602, 625)

NOTE : See Table 601 (Ref. Fig. 601, 602) for additional AP-8 borescope access port data.
Borescope access port AP-9 may also be used if desired.
Remove and install AP-9 plug per subsequent paragraph.

CAUTION : TEMPERATURES IN AREAS TO BE BORESCOPED SHOULD BE PERMITTED TO COOL TO BELOW 150°F (65.6°C) FOLLOWING ENGINE OPERATION.
DAMAGE MAY RESULT TO BORESCOPE EQUIPMENT IF EQUIPMENT IS EXPOSED TO GASPATH OR METAL TEMPERATURES IN EXCESS OF 150°F (65,6°C).
AS A GUIDE, IF ADJACENT CASES ARE TO HOT TO TOUCH COMFORTABLY, BORESCOPE INSPECTION SHOULD BE DELAYED.

(2)Insert borescope through port and inspect condition of inner combustion chamber assembly, outer combustion chamber assembly, bulkhead, fuel infectors, and heatshiels in accordance with step (3) inspection limits.

NOTE : Maximum borescope insertion depth and borescope limiting access hole diameter specifications for AP-8 and AP-9 borescope ports are provided in Table 601 (Sheet 3).

(3)Inspection limits

CAUTION : FOLLOWING LIMITS ARE APPLICABLE ON A CONTINUE-IN-SERVICE BASIS ONLY. LIMIT IS BASED ON PART STRUCTURAL REQUIREMENTS AND DOES NOT IMPLY THAT ENGINE PERFORMANCE, STABILITY, OPERATING LIMITS, OR PART REPARABILITY WILL BE MAINTAINED.

(a)Limits for conditions observed during borescope inspection of combustion area are provided in Table 603 and in the following referenced figures :
(Ref. Fig. 634, 635, 636)
(Ref. Fig. 637, 638, 639)
(Ref. Fig. 640, 641)

Combustion Chamber Area Borescope
Inspection/Distress Limits
Table 603

INSPECTION AREA	OBSERVED CONDITION	CONTINUE-IN-SERVICE LIMITS REGULAR INTERVAL INSPECTION	CONTINUE-IN-SERVICE LIMITS REDUCED INTERVAL INSPECTION OF 125 CYCLES
Inner Combustion AND Outer Combustion Chamber Assembly, Except Bulkhead	Burn-through (Open holes)	1. Maximum of four burn-through holes each assembly.	1. Maximum of six burn-through holes each assembly.
		2. Largest dimension of each hole may not exceed 0.500 in. (12.700 mm) or 0.19 Sq. In. (123 Sq. mm)	2. Largest dimension of each hole may not exceed 0.500 in. (12.700 mm) or 0.19 Sq. In. (123 Sq. mm)
		3. Burn-through holes must be separated by a minimum of 6 in. (152.400 mm) of sound material. (Axially and/or circumferentially)	3. Burn-through holes must be separated by a minimum of 6 in. (152.400 mm) of sound material (Axially and /or circumferentially)
	Burning, Distortion, Missing Louver Lip Material, Burn-streak	1. Unlimited amount of burning, distorsion, and missing louver lip material is permitted circumferentially on each louver provided other limits are not exceeded.	1. If more than three axially successive louvers exhibit significant distress, a burn-streak is developing. This burn-streak should be monitored according to burn-hole size, crack length and crack intersection limits. If these limits are exceeded the assembly should be removed.

INSPECTION AREA	OBSERVED CONDITION	CONTINUE-IN-SERVICE LIMITS REGULAR INTERVAL INSPECTION	CONTINUE-IN-SERVICE LIMITS REDUCED INTERVAL INSPECTION OF 125 CYCLES
		2. Significant distress appearing axially on three successive louvers and limited to three successive louvers (indicates development of burn-streak).	
	Burning (Burned Areas), Missing Material or Coating Depletion	1. Unlimited on each louver to burn-through or burn-streak limit. NOTE : If significant distress or missing material is found particularily on the last louver, a thorough inspection of the downstream turbine airfoils is recommended.	
	Chipped Coating, Thermal Barrier Ceramic Coating Loss	1. Unlimited on each louver, however loss of coating may accelerate deterioration.	
	louver lip (gap) closure and burning.	1. Unlimited, provided burn-through limits are not exceeded. However, excessive closure will accelerate downstean deterioration.	
R	Bent, Buckled Or Distorted Louvers	1. Unlimited on each louver provided other limits are not exceeded.	
	Individual Axial Cracks		
	NOTE : For axial cracks that enter combustion, dilution or ignitor holes, the diameter of the manufactured hole does not need to be added to determine the crack length until the crack is seen exiting from the opposite side of the hole.		

	INSPECTION AREA	OBSERVED CONDITION	CONTINUE-IN-SERVICE LIMITS	
			REGULAR INTERVAL INSPECTION	REDUCED INTERVAL INSPECTION OF 125 CYCLES
R R			1. Unlimited number up to 3/4 in. or 0.75 in. (19.050 mm) long.	
			2. Cracks can completely traverse one louver but must be separated circumferentially by 6.0 in. (152.400 mm) minimum.	1. Cracks can completely traverse one louver. Maximum of 2 cracks every 6.0 in. (152.400 mm) of louver material. Cracks must be parated circumferentially by 0.75 in. (19.050 mm).
				2. Cracks can comtely traverse one louver. Maximum of 3 cracks every 6.0 in. (152.400 mm) of louver material. Cracks must be separated circumferentially by 1.50 in. (38.100 mm).
			NOTE : If these limits are exceeded, contact Pratt & Whitney for recommendation on disposition.	
			3. Cracks can completely traverse on OBL No. 9 (rear most) louver, but must be separated circumferentially by 2.5 in. (63.5 mm) minimum. On OBL No. 9 louver (rear most), the minimum separation of cracks must be	

	INSPECTION AREA	OBSERVED CONDITION	CONTINUE-IN-SERVICE LIMITS REGULAR INTERVAL INSPECTION	CONTINUE-IN-SERVICE LIMITS REDUCED INTERVAL INSPECTION OF 125 CYCLES
			2.5 in. (63.5 mm). NOTE : An individual crack is a crack confined to one louver.	
		Intersection of Axial and Circumferential Cracks	1. Intersection of individual or continuous axial cracks and circumferential cracks is not permitted unless the circumferential cracks are confined to the louver lip portion of the louver. Louver lip material missing as a result of such crack intersection is permitted Maximum length of circumferential crack in lip area is 2.0 in. (50.800 mm).	1. Intersection of individual or continuous axial cracks and circumferential cracks is not permitted unless the circumferential cracks are confined to the louver lip portion of the louver. Louver lip material missing as a result of such crack intersection is permitted. Maximum length of circumferential crack in lip area is 2.0 in. (50.800 mm).

NOTE : Use the following hot side inspection only if a cold side inspection is not easily accessible. This inspection is used to determine if a knuckle between two louvers is cracked by looking through a borescope at the inner (hot side) surface of the burner rather than the outer (cold side) surface.

To utilize the inner surface inspection method, all cracked surfaces in the continuous axial crack must be inspected for crack width. If all the louver cracks are less than 0.060 in. (1.524 mm) wide, they should be classified as individual cracks. If 2 consecutive louvers have cracks widths that exceed 0.060 in. (1.524 mm) they should be classified as a 2 louver crack. This same inspection method should also be used for cracks that extend more than 3 louvers.

Cracks are classified as individual axial cracks if they do not go through the louver knuckle area. An outer

INSPECTION AREA	OBSERVED CONDITION	CONTINUE-IN-SERVICE LIMITS	
		REGULAR INTERVAL INSPECTION	REDUCED INTERVAL INSPECTION OF 125 CYCLES
	(cold side) inspection is optional to check if the cracks go through the louver knuckle area. If the outer (cold side) inspection shows that the cracks do not go through the louver knuckle area, then cracks are classified as individual axial cracks.		
R R		(Continuous axial cracks must be monitored with reduced interval)	1. Two louver crack, if the measured crack width on each of the adjacent louvers is greater than 0.060 in. (1.524 mm) wide **AND/OR** louver wall deformation or surface mismatch is greater than 0.060 in. (1.524 mm). Individual crack separation limits apply for two louver cracks.
			2. Three louver crack, if the measured crack width on each of the three adjacent louvers is greater than 0.060 in. (1.524 mm) wide and louver wall deformation or surface mismatch is greater than 0.060 in. (1.524 mm). Three louver cracks must be apart circumferentially by 20.0 in.

INSPECTION AREA	OBSERVED CONDITION	CONTINUE-IN-SERVICE LIMITS	
		REGULAR INTERVAL INSPECTION	REDUCED INTERVAL INSPECTION OF 125 CYCLES
			(508.00 mm) minimum.
			3. Four louver crack, if the measured crack width on each of the four adjacent louvers is greater than 0.060 in. (1.524 mm) wide but less than 0.150 in. (3.810 mm), AND/OR louver wall deformation or surface mismatch is greater than 0.060 in. (1.524 mm) but less than 0.150 in. (3.810 mm). Engine must be scheduled off wing within 40 hours.
			4. Greater than three louver crack, engine must be removed immediately if the crack is greater than 0.150 in. (3.810 mm) wide, and louver wall deformation or surface mismatch is greater than 0.150 in. (3.810 mm).
		NOTE : As a burn streak develops, louver material distorts, cracks and/or burns away. Individual axial louver cracks may continue to propagate and,	

INSPECTION AREA	OBSERVED CONDITION	CONTINUE-IN-SERVICE LIMITS REGULAR INTERVAL INSPECTION	CONTINUE-IN-SERVICE LIMITS REDUCED INTERVAL INSPECTION OF 125 CYCLES
		although axially askew, join together to form a continuous crack within the burn streak, which penetrates the liner wall.	
	Circumferential Cracks	1. None permitted except in lip region.	1. None permitted except in lip region
		2. Maximum length of circumferential crack in lip region is 2.0 In. (50.800 mm).	
	Intersection of Burn-Holes by Axial Cracks	Intersection of burn holes by axial cracks is permitted. The previously established burn-hole and cracks length dimension should be applied separately. However, when defining rack length, the hole width should be considered as part of the overall crack length.	
Fuel Injector Guide Heatshield	Cracks in Heatshield Face	1. Unlimited cracks less than 0.25 in. (6.350 mm) in length are permitted. Two cracks maximum (per face) may progress completely across each face, but must be separated by 45a on both heatshields. No intersecting cracks.	1. Unlimited cracks less than 0.25 in. (6.350 mm) in length are permitted. Four cracks maximum (per face) may progress completely across each face, but must be separated by 30° on both heatshields. No intersecting cracks.
	Heatshield Face Erosion, Missing Material, and burning	1. Erosion and burning is permitted provided none of the impingement holes beneath the heatshield inner face are exposed when viewing the heatshield from the rear.	1. Erosion and burning of the heatshield inner face is permitted to expose up to four impingement cooling holes beneath the heatshield inner face.

INSPECTION AREA	OBSERVED CONDITION	CONTINUE-IN-SERVICE LIMITS	
		REGULAR INTERVAL INSPECTION	REDUCED INTERVAL INSPECTION OF 125 CYCLES
		2. Outer face erosion can extend 0.2 in. (5.08 mm) inward from outer face for 360 DEG.	2. Outer face erosion can extend inward to within 0.025 in. (0.635 mm) of inner rear for 360 DEG.
		3. Heatshield distortion and burning is permitted provided that the heatshield face erosion and crack limits are not exceeded. The resulting distress to the bulkhead must not exceed the bulkhead distress limits.	
	Magnesium Zirconate Coating Loss	1. Any amount permitted ; however, loss of coating will accelerate deterioration.	
Fuel Injector End Cap/Tip Heatshield	1. Radial Cracks	1. Any amount permitted	
	2. Circumferential Cracks along the outer DIA	2. Any amount permitted	
	3. End Cap Material Liberation (Segments broken away)	3. Any amount permitted	
Bulkhead	Burned, Eroded, Distorted Areas or Holes	1. None permitted	1. None permitted
	Individual Cracks (Radial & Circumferential	1. Individual radial or circumferential cracks to 0.50 inch (12.7 mm) in length are	1. Individual radial or circumferential cracks to 1.00 inch (25.4 mm)

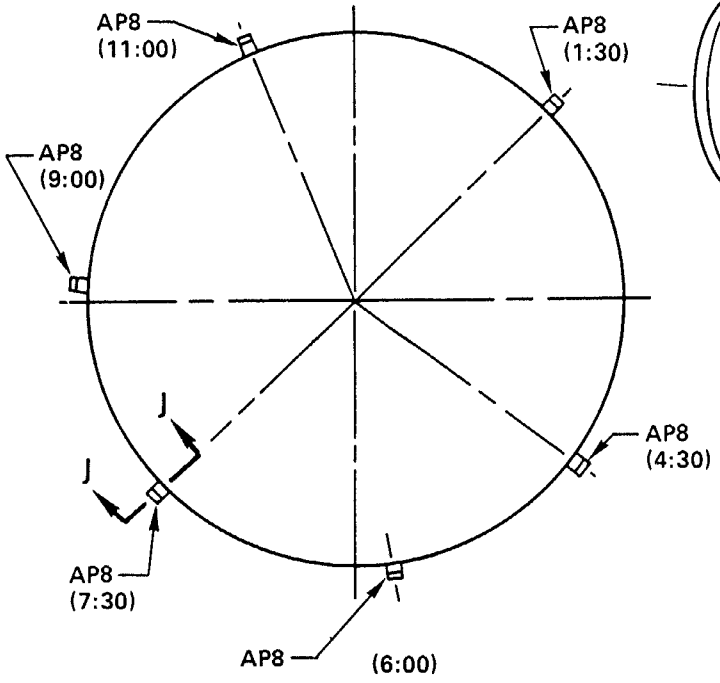
	INSPECTION AREA	OBSERVED CONDITION	CONTINUE-IN-SERVICE LIMITS REGULAR INTERVAL INSPECTION	CONTINUE-IN-SERVICE LIMITS REDUCED INTERVAL INSPECTION OF 125 CYCLES
R			permitted.	in length are permitted. Cracks must be separated circumferentially by 6.00 inches (152.4 mm) of sound material.
R			2. Cracks must be separated circumferentially by 6.00 inches (152.4 mm) of sound material.	2. Multiple cracks, with less than 6.00 inches (152.4 mm) circumferential separation, are permitted if the sum of crack lengths is not greater than 2.00 inches (50.8 mm) and the maximum individual crack length is not greater than 0.75 inch (19.05 mm).
R			3. No cracks running under a fuel injector heat shield are permitted.	3. No cracks running under a fuel injector heat shield are permitted.
R				4. Cracks which if extended would form a loop are not permitted.

(4)After borescope inspection, reinstall AP8 plugs using new gaskets, per requirements of table 604 and, if previously removed, reinstall AP9 plug and new washer per requirement of table 605.
CAUTION : MAKE CERTAIN THAT BORESCOPE PLUGS ARE CORRECTLY INSTALLED. A

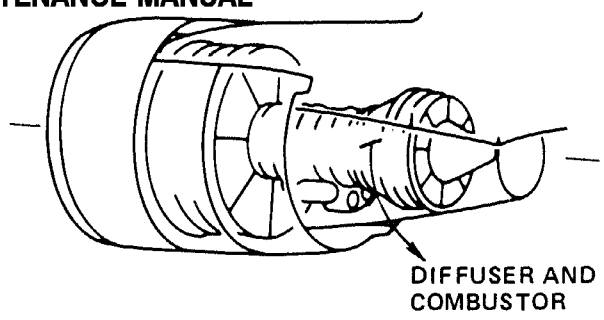
MISSING PLUG CAN CAUSE IMPORTANT DAMAGE TO COMPONENTS AND/OR NACELLE STRUCTURE.

AP-8 Borescope Plug Installation Data
Table 604

AP Number and Diffuser Case Location	Gasket Required	Plug Locking Method	Plug Replacement Lubricant	Plug Torque Lbf. In. m.daN
AP-8 1:30 o'clock	Yes PN 673049	Lockwire (AS3214-02)	P06-023 Silver Goop	40-50 (0.45-0.56)
AP-8 4:30 o'clock	(Same)	(Same)	(Same)	(Same)
AP-8 6:00 o'clock	(Same)	(Same)	(Same)	(Same)
AP-8 7:30 o'clock	(Same)	(Same)	(Same)	(Same)
AP-8 9:00 o'clock	(Same)	(Same)	(Same)	(Same)
AP-8 11:00 o'clock	NOTE : If the high stage temp sensor was removed to borescope thru the 338° AP-8 port, reinstall (Ref. 36-11-18, P. Block 401).			

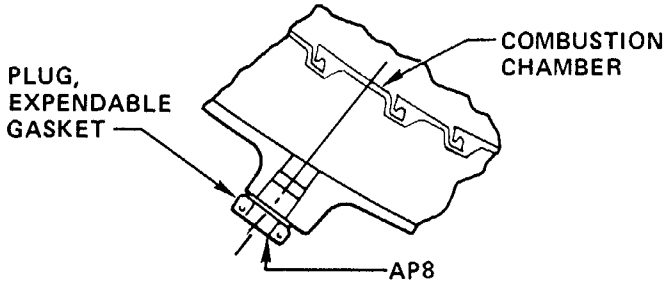


REAR VIEW
DIFFUSER AND COMBUSTOR
GROUP



AP8
BORESCOPE ACCESS PORTS:

- SEE TABLE 601 FOR AP–8 DATA
- REMOVE PLUG AP8 AND GASKET FROM DIFFUSER CASE TO VIEW FUEL INJECTOR COMBUSTION CHAMBER AND STAGE 1 HPT VANES
- AFTER BORESCOPE INSPECTION REINSTALL PLUG AND NEW GASKET IN ACCORDANCE WITH REQUIREMENTS OF INSTALLATION TABLE.



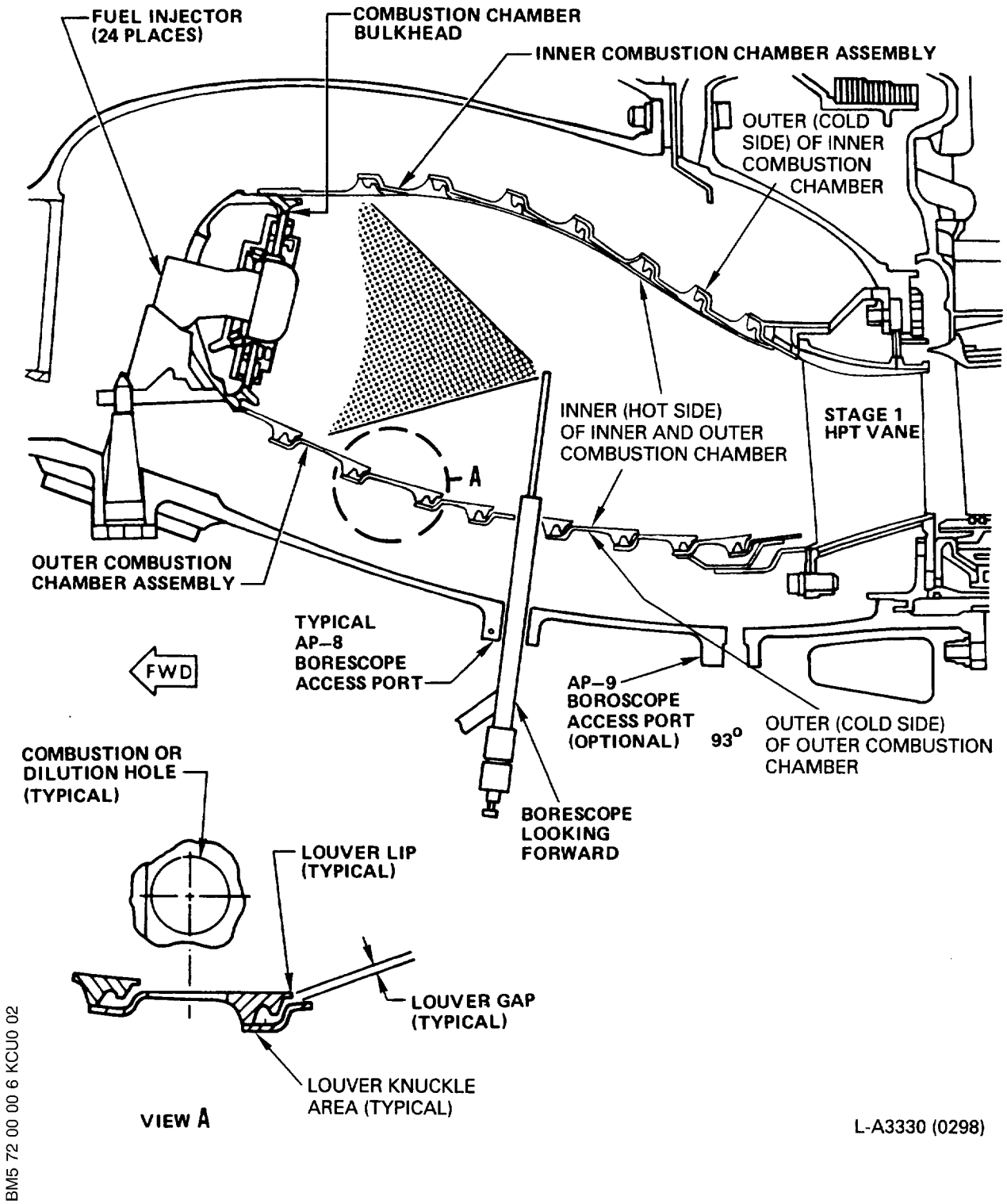
SECTION J-J

(1:30, 4:30, 6:00, 7:30, 9:00,11:00 LOCATIONS)

BM5 72 00 00 6 KAUO - 23

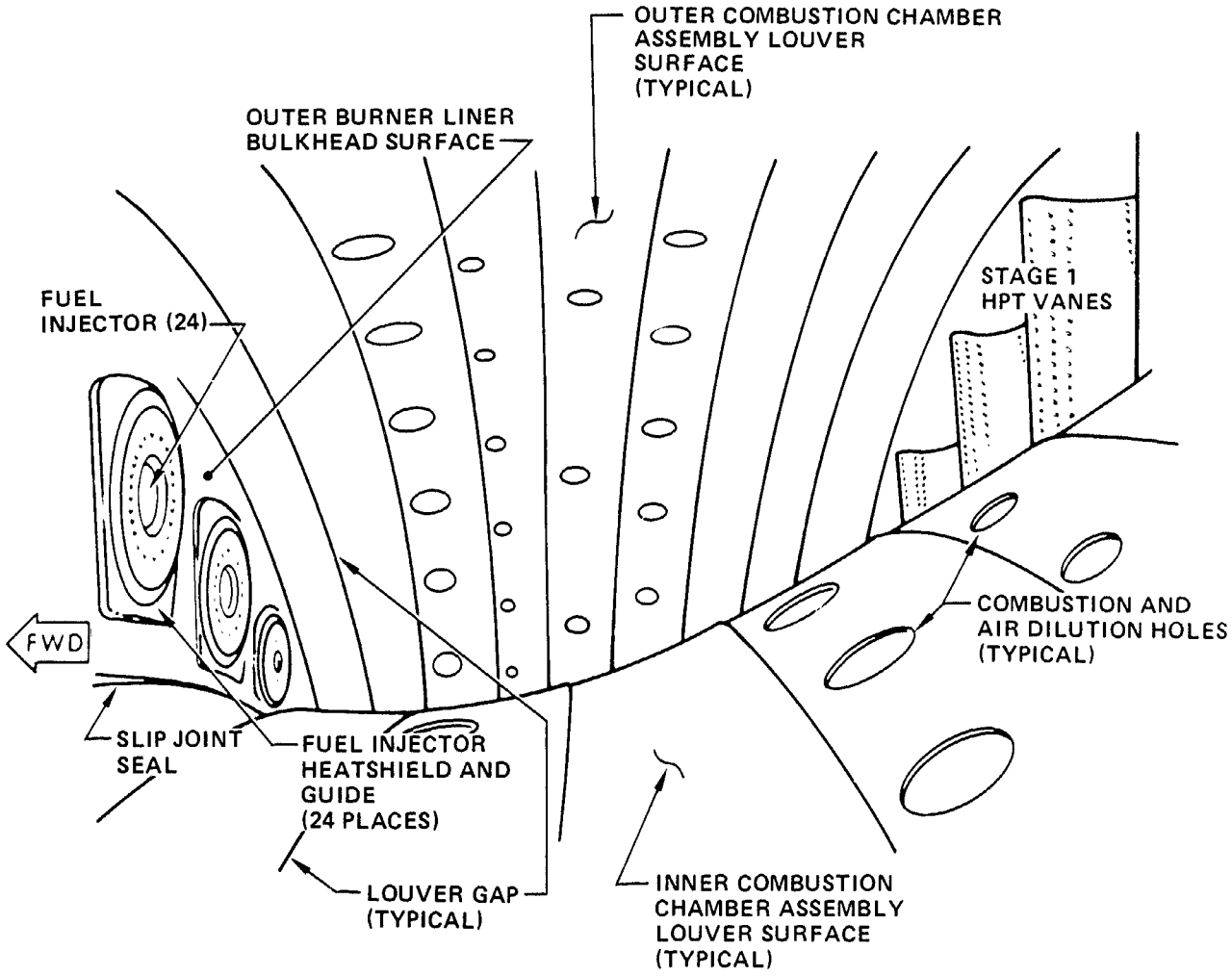
L – A3338

Borescope AP-8 Access Port - Location on Diffuser Case Assembly
Figure 625



BM5 72 00 00 6 KCU0 02

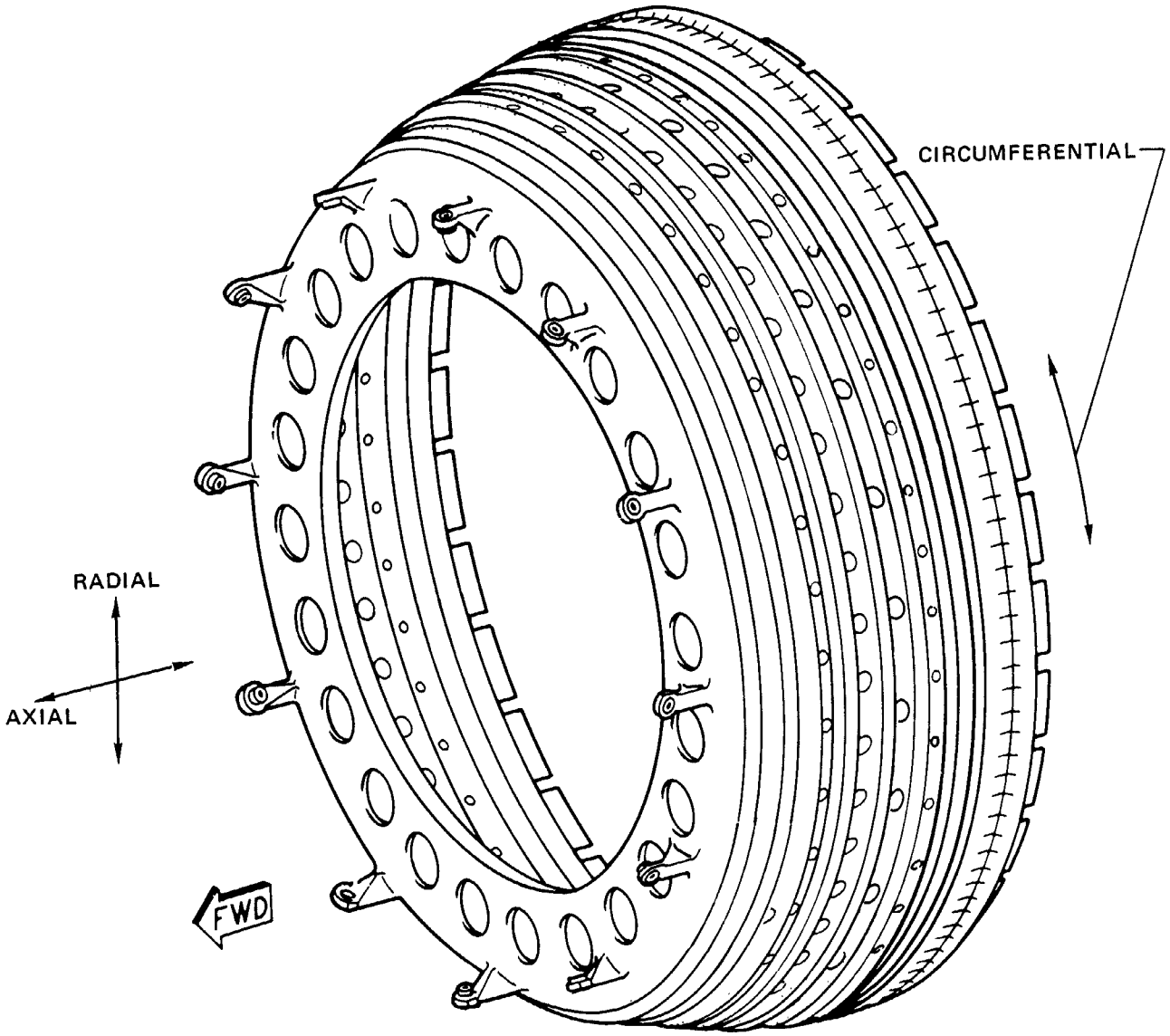
Borescope View of Diffuser and Combustor Area (AP-8)
Figure 626


OUTER COMBUSTION CHAMBER ASSEMBLY LOUVER SURFACE (TYPICAL)
OUTER BURNER LINER BULKHEAD SURFACE
FUEL INJECTOR (24)
STAGE 1 HPT VANES
FWD
COMBUSTION AND AIR DILUTION HOLES (TYPICAL)
SLIP JOINT SEAL
FUEL INJECTOR HEATSHIELD AND GUIDE (24 PLACES)
LOUVER GAP (TYPICAL)
INNER COMBUSTION CHAMBER ASSEMBLY LOUVER SURFACE (TYPICAL)

BM5 72 00 00 6 KEUO - 23

L – A3336

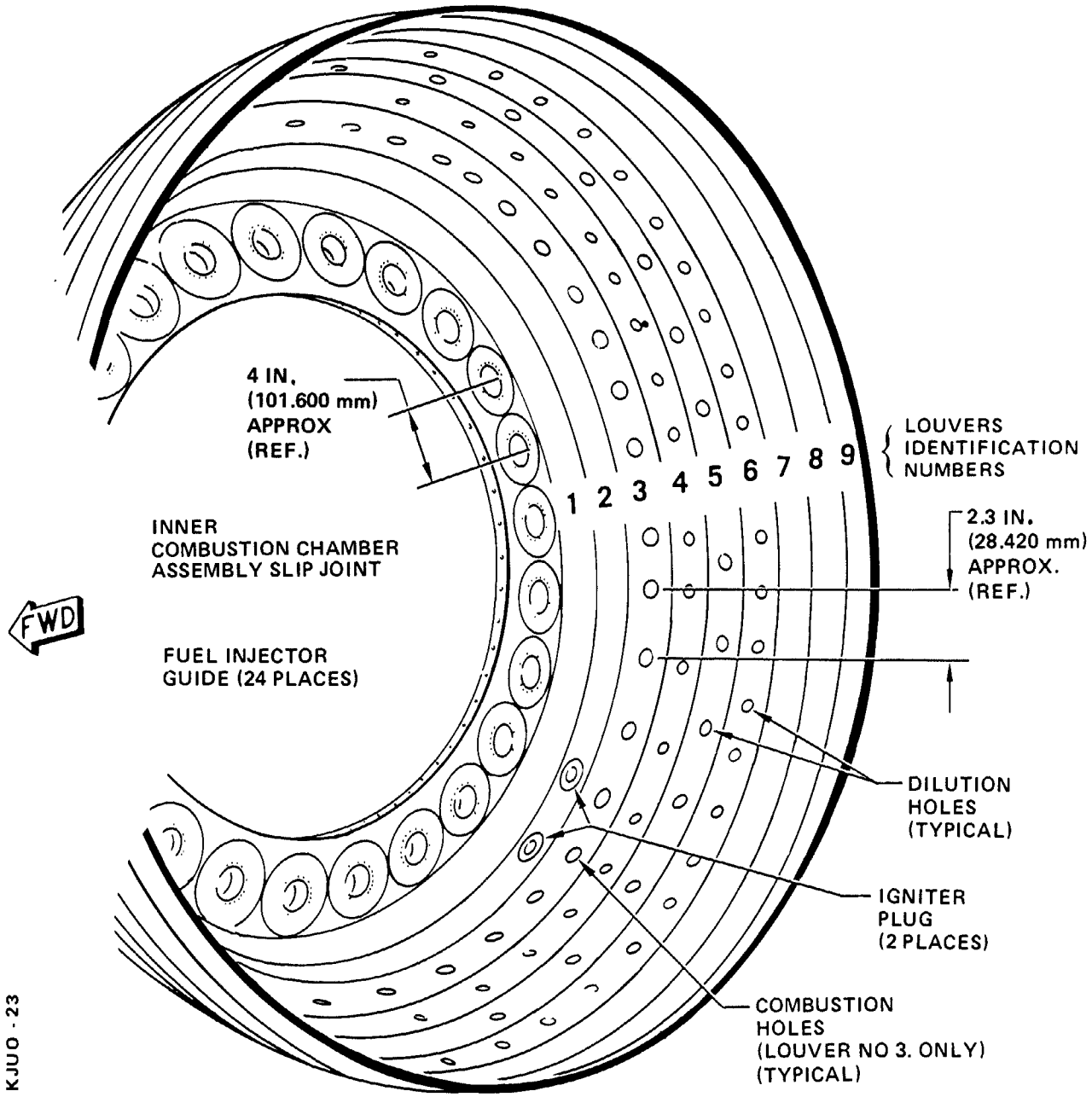
Borescope View and Visual Identification
of Combustion Chamber Area
Figure 627



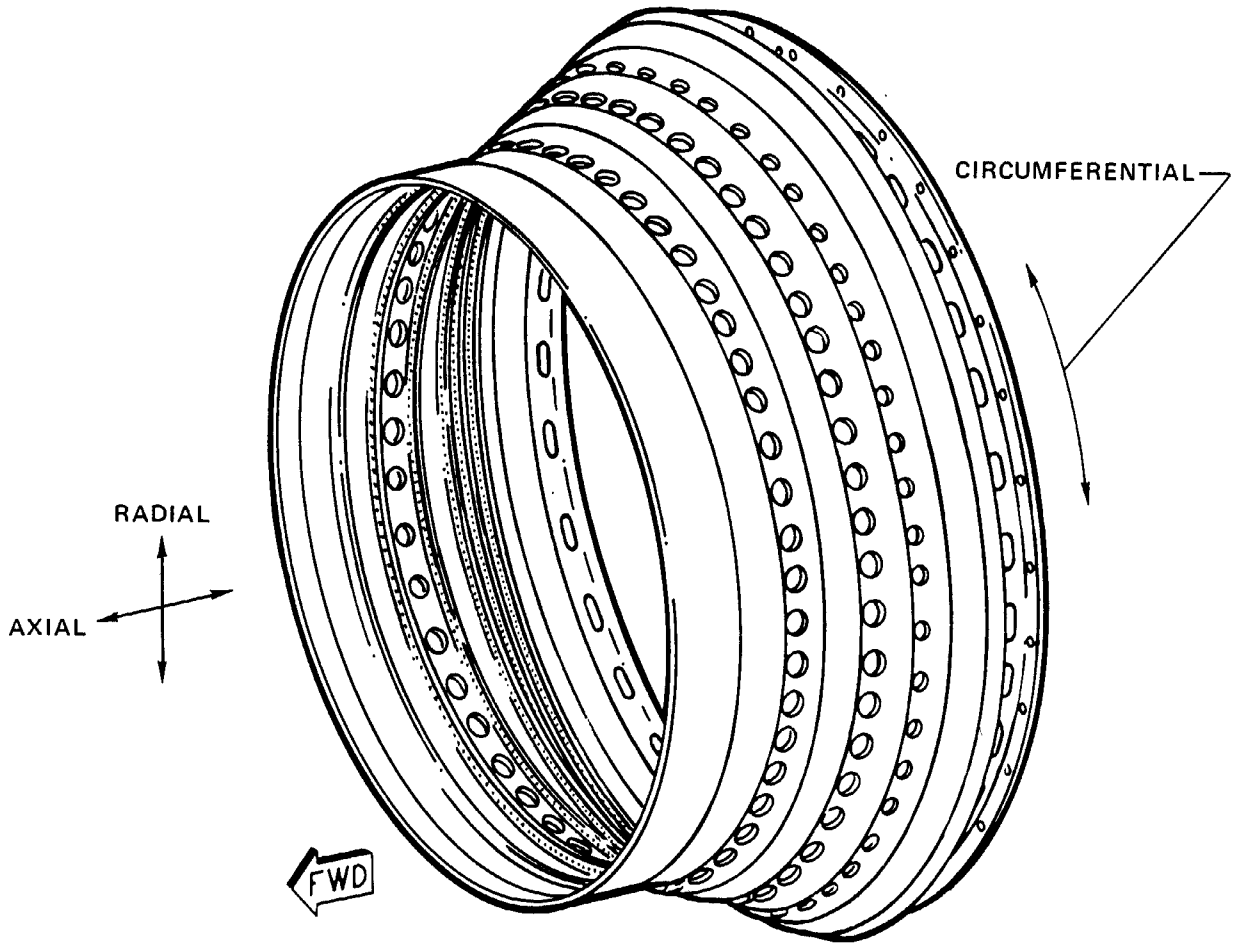
BM5 72 00 00 6 KGUO - 23

L – A3333

Outer Combustion Chamber Assembly - Definition of Terms
Figure 628



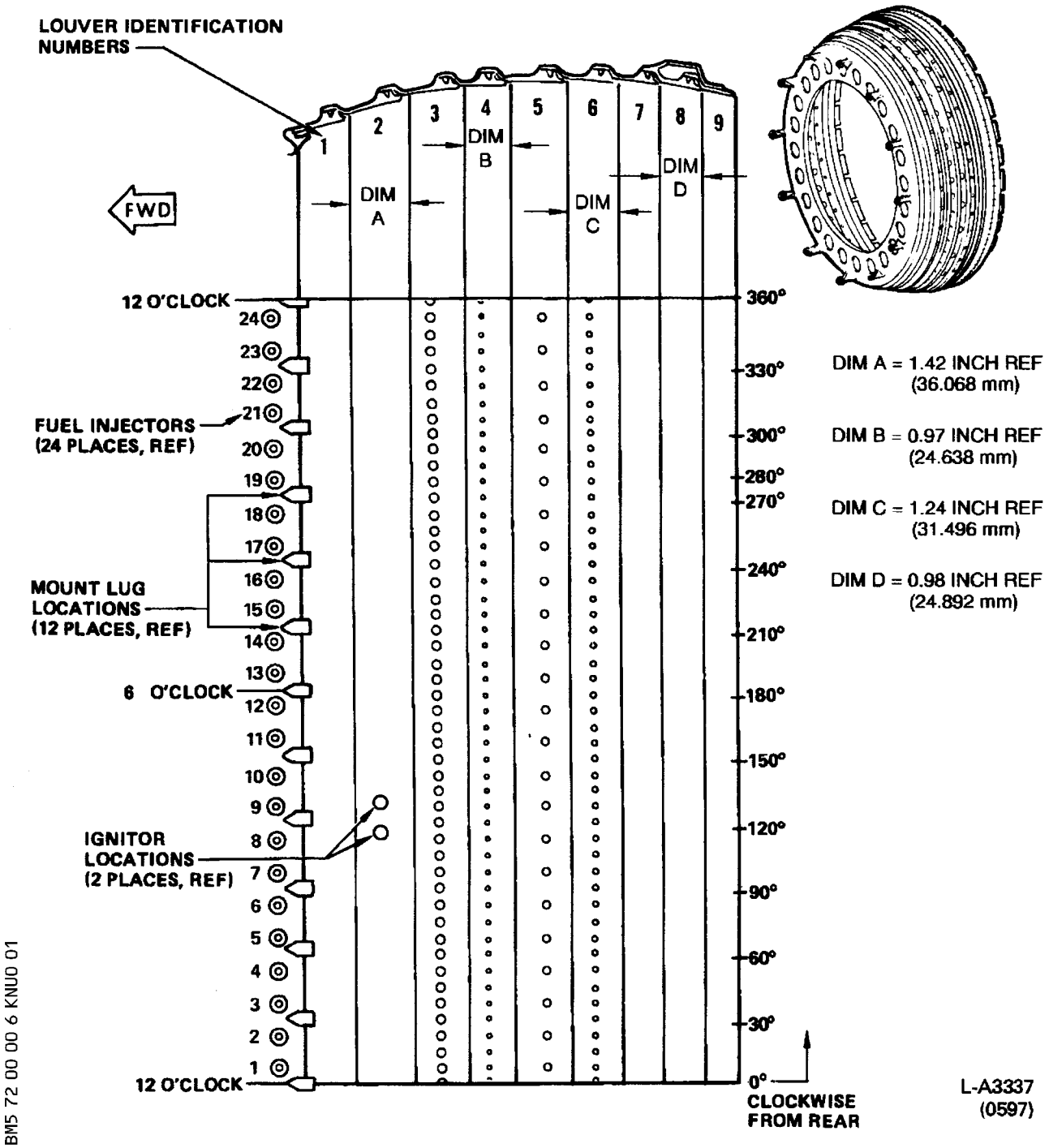
Outer Combustion Chamber Assembly - Definition of Terms (ID)
Figure 629



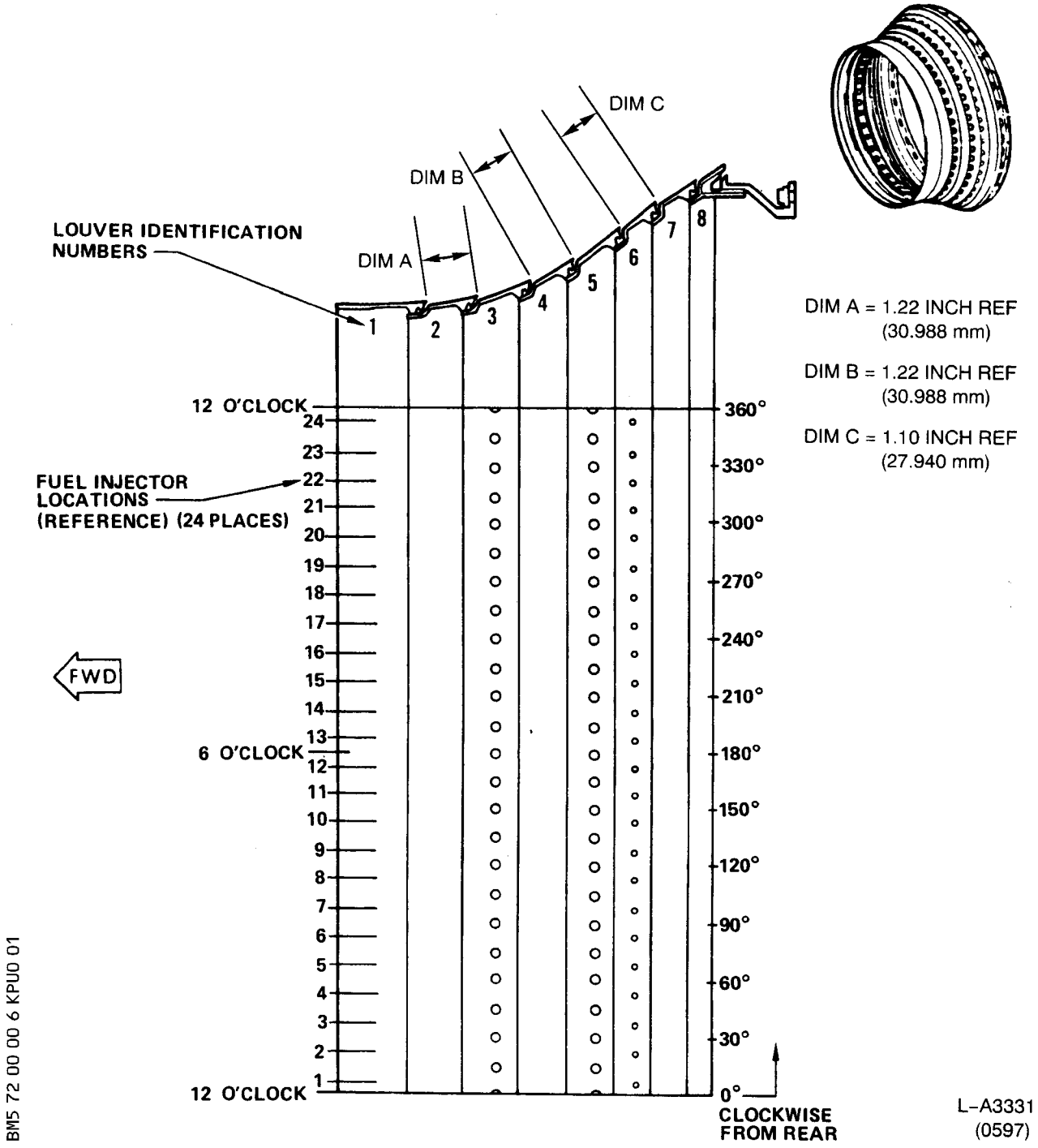
BM5 72 00 00 6 KLUO - 23

L – A3332

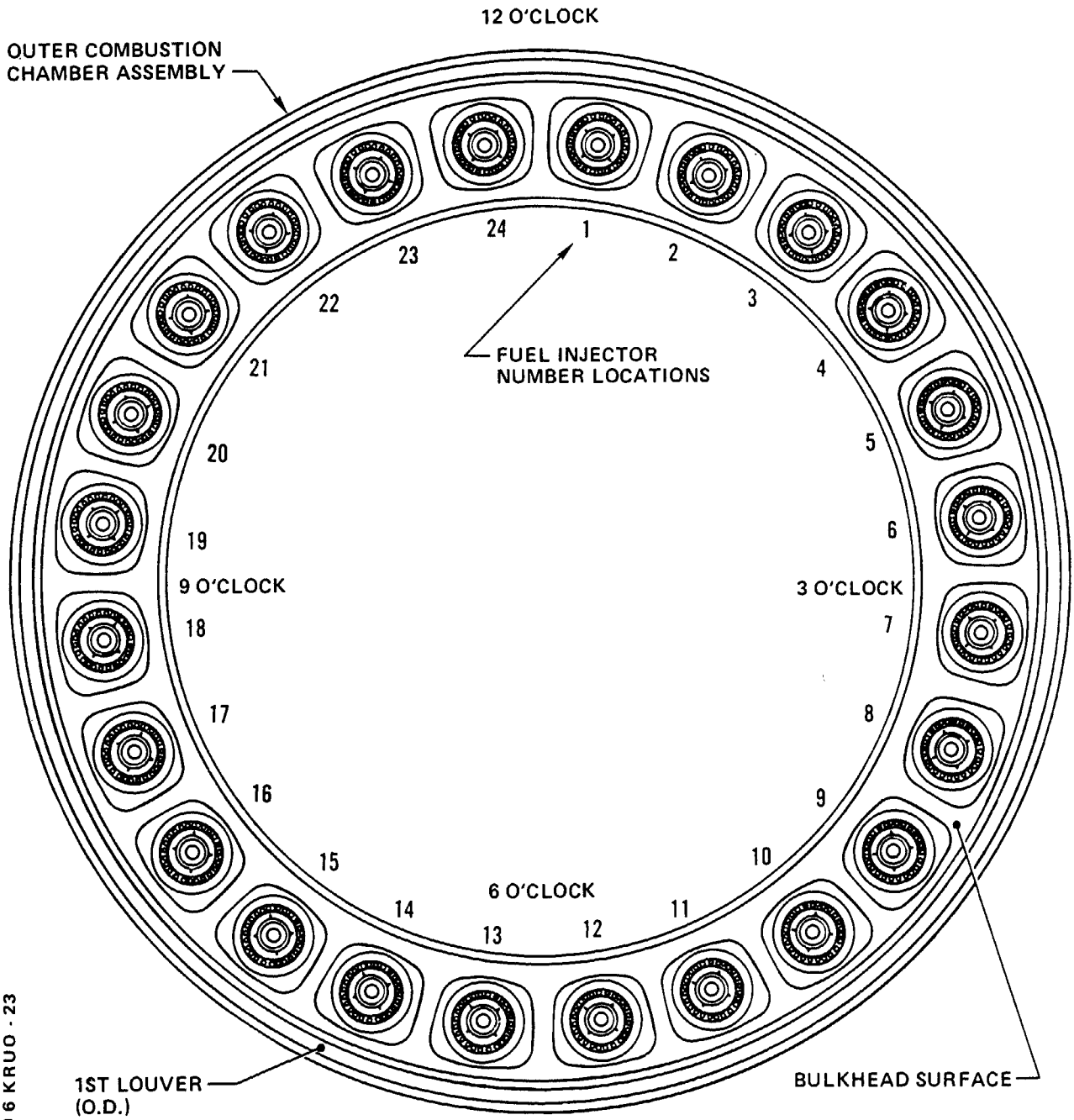
Inner Combustion Chamber Assembly - Definition of Terms
Figure 630



Outer Combustion Chamber Assembly Plan View - Inboard Surface
Figure 631



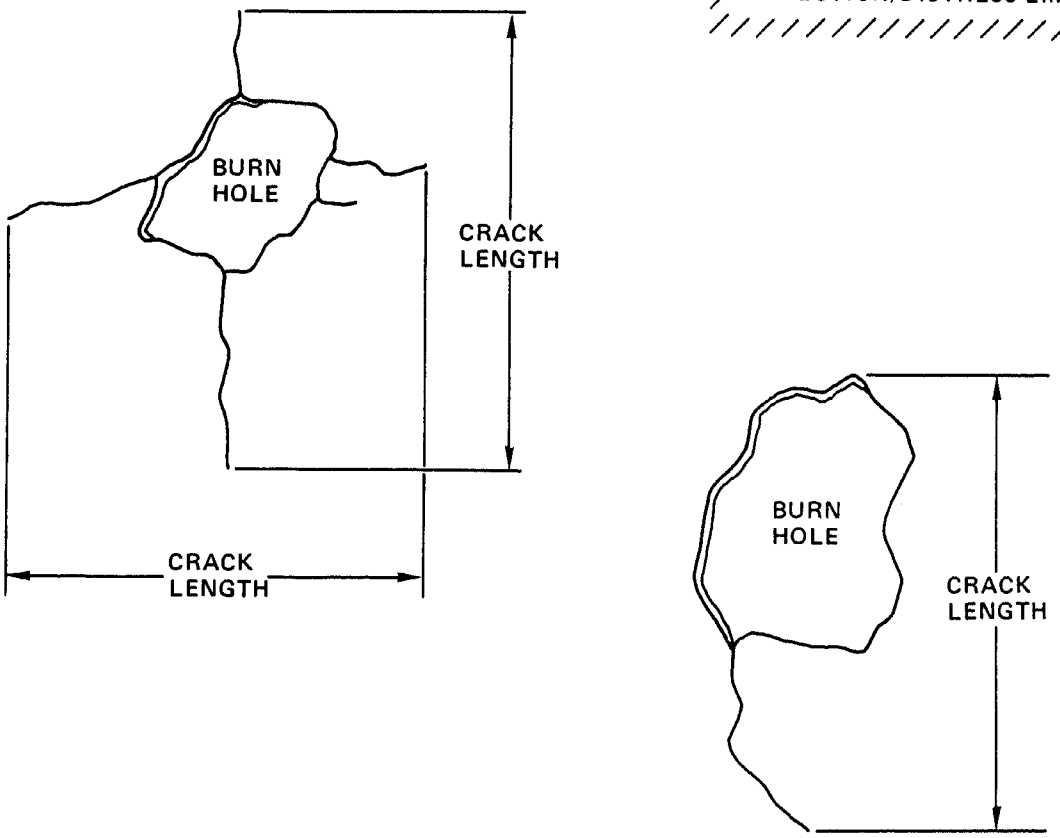
Inner Combustion Chamber Assembly Plan View - Outboard Surface
Figure 632



Outer Combustion Chamber Assembly - Bulkhead/Fuel Injector Area
Figure 633

NOTE

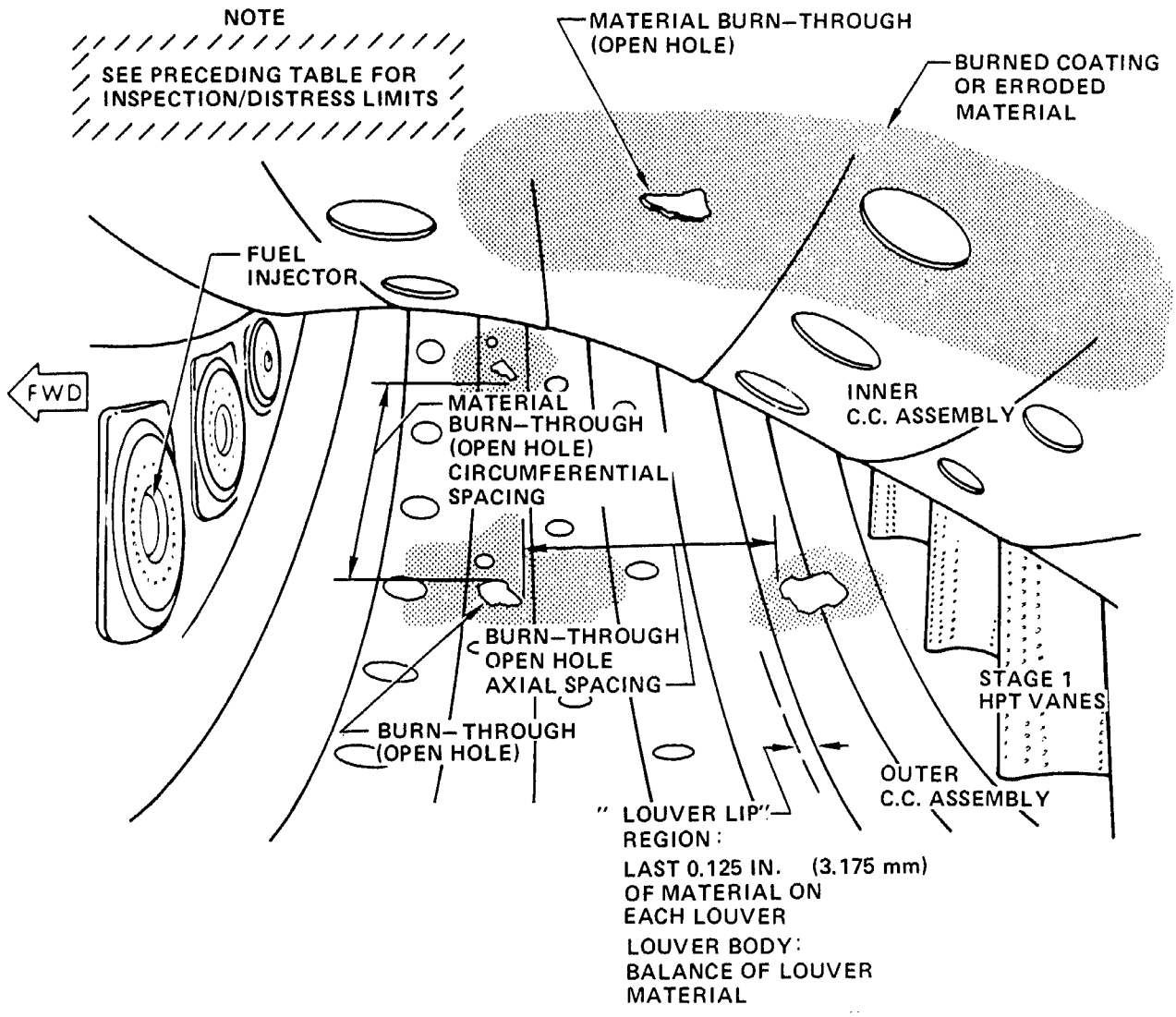
SEE PRECEDING TABLE FOR INSPECTION/DISTRESS LIMITS



BM5 72 00 00 6 KTUO - 23

L – A3327

Inner and Outer Combustion Chamber Assemblies
Burn Hole and Crack Intersection
Figure 634


NOTE
SEE PRECEDING TABLE FOR INSPECTION/DISTRESS LIMITS
MATERIAL BURN–THROUGH (OPEN HOLE)
BURNED COATING OR ERRODED MATERIAL
FUEL INJECTOR
FWD
INNER C.C. ASSEMBLY
MATERIAL BURN–THROUGH (OPEN HOLE) CIRCUMFERENTIAL SPACING
BURN–THROUGH OPEN HOLE AXIAL SPACING
BURN– THROUGH (OPEN HOLE)
STAGE 1 HPT VANES
OUTER C.C. ASSEMBLY
" LOUVER LIP" REGION:
LAST 0.125 IN. (3.175 mm) OF MATERIAL ON EACH LOUVER
LOUVER BODY:
BALANCE OF LOUVER MATERIAL

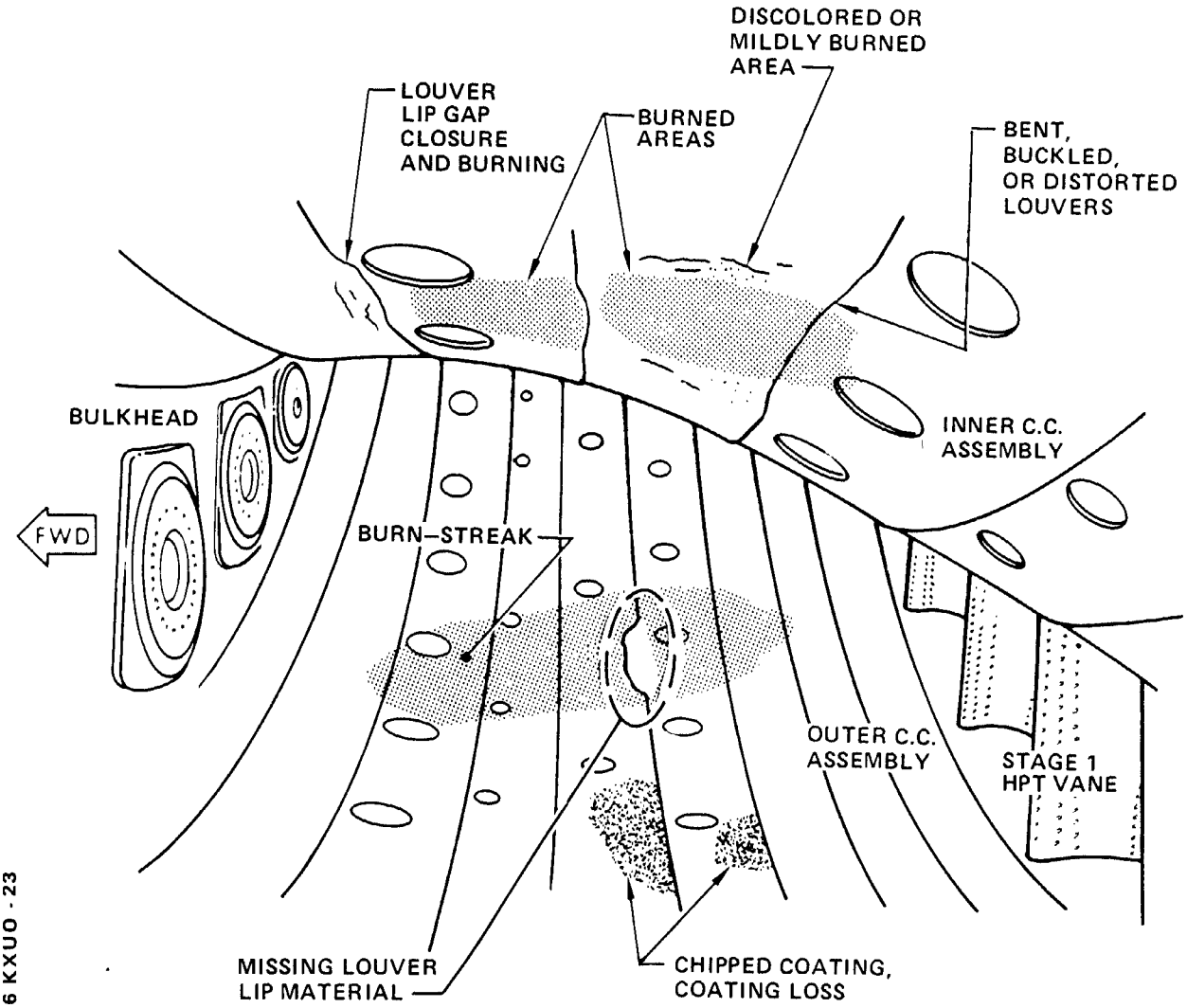
BM5 72 00 00 6 KVUO - 23

L – A3325

Combustion Chamber Assembly - Inspection/Distress Limits
Figure 635

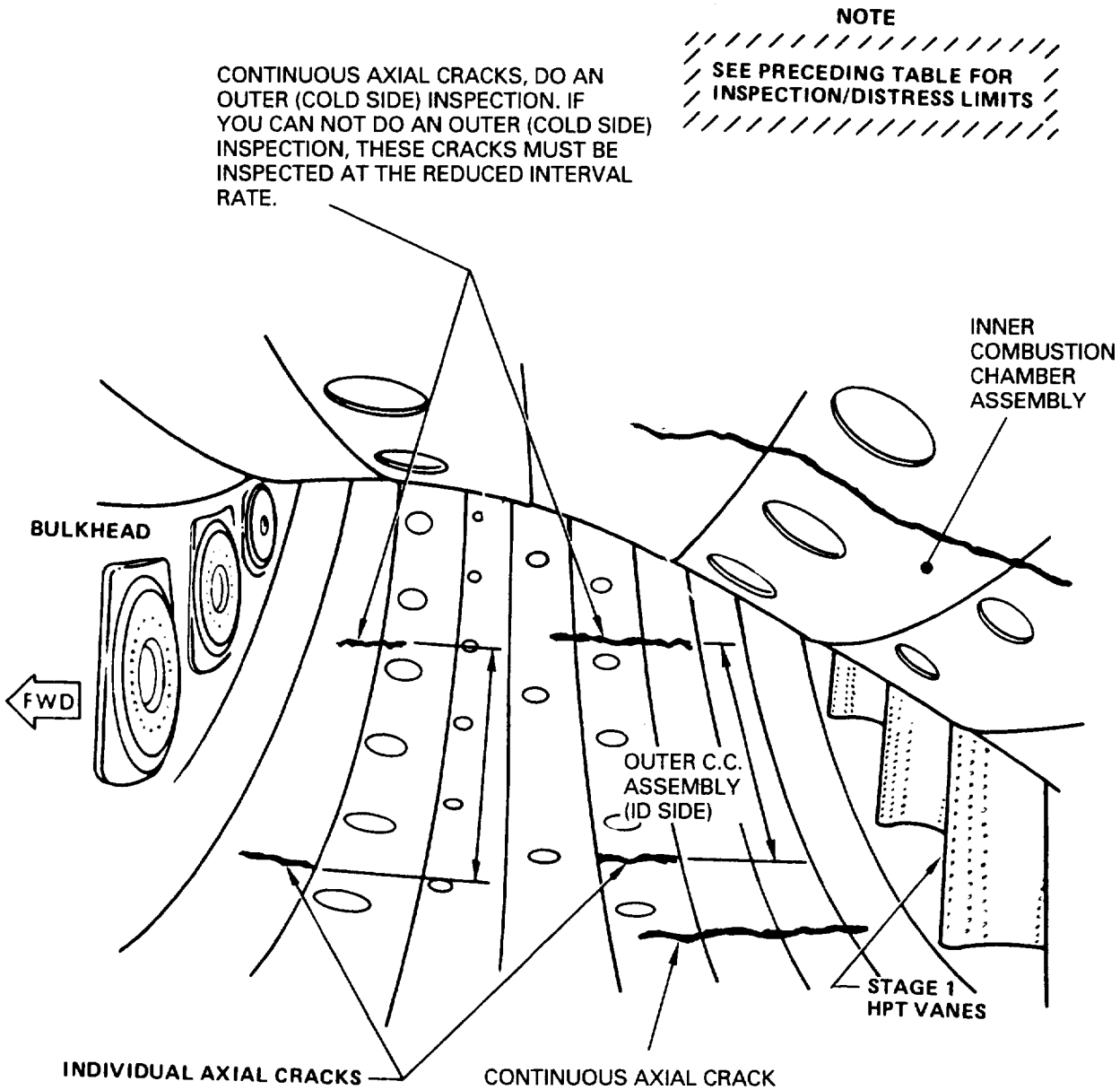
NOTE

SEE PRECEDING TABLE FOR INSPECTION/DISTRESS LIMITS



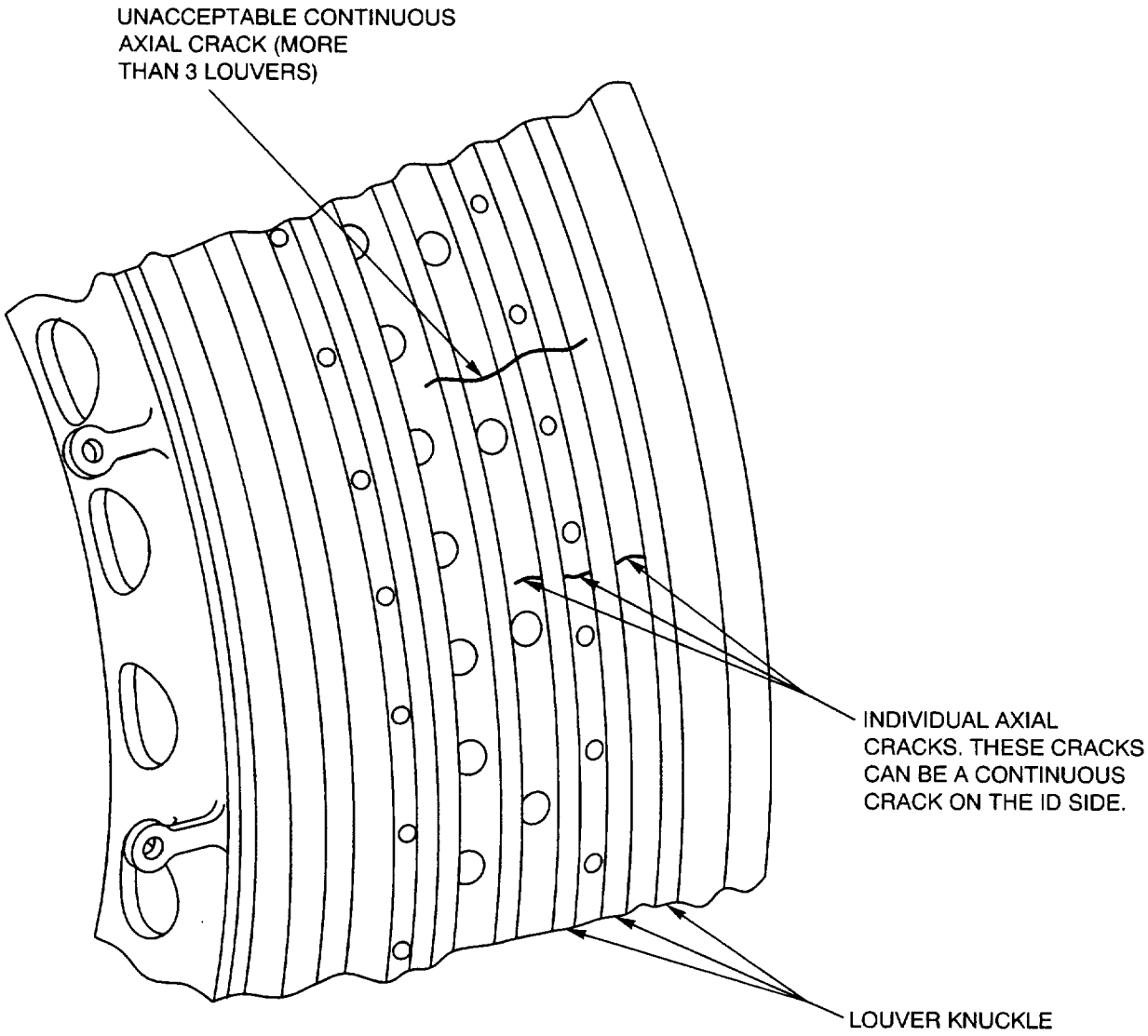
BM5 72 00 00 6 KXUO - 23

Combustion Chamber Assembly - Inspection/Distress Limits
Figure 636


NOTE
SEE PRECEDING TABLE FOR INSPECTION/DISTRESS LIMITS
CONTINUOUS AXIAL CRACKS, DO AN OUTER (COLD SIDE) INSPECTION. IF YOU CAN NOT DO AN OUTER (COLD SIDE) INSPECTION, THESE CRACKS MUST BE INSPECTED AT THE REDUCED INTERVAL RATE.
INNER COMBUSTION CHAMBER ASSEMBLY
BULKHEAD
FWD
OUTER C.C. ASSEMBLY (ID SIDE)
STAGE 1 HPT VANES
INDIVIDUAL AXIAL CRACKS
CONTINUOUS AXIAL CRACK (MORE THAN 3 LOUVERS) YOU MUST DO AN OUTER (COLD SIDE) INSPECTION. IF YOU CAN NOT DO AN OUTER INSPECTION, THIS CRACK IS CLASSIFIED AS AN UNACCEPTABLE CRACK.
L-A3324 (0298)

BM5 72 00 00 6 KZUA 01

Combustion Chamber Assembly - Inspection/Distress Limits
(Sheet 1/2)
Figure 637

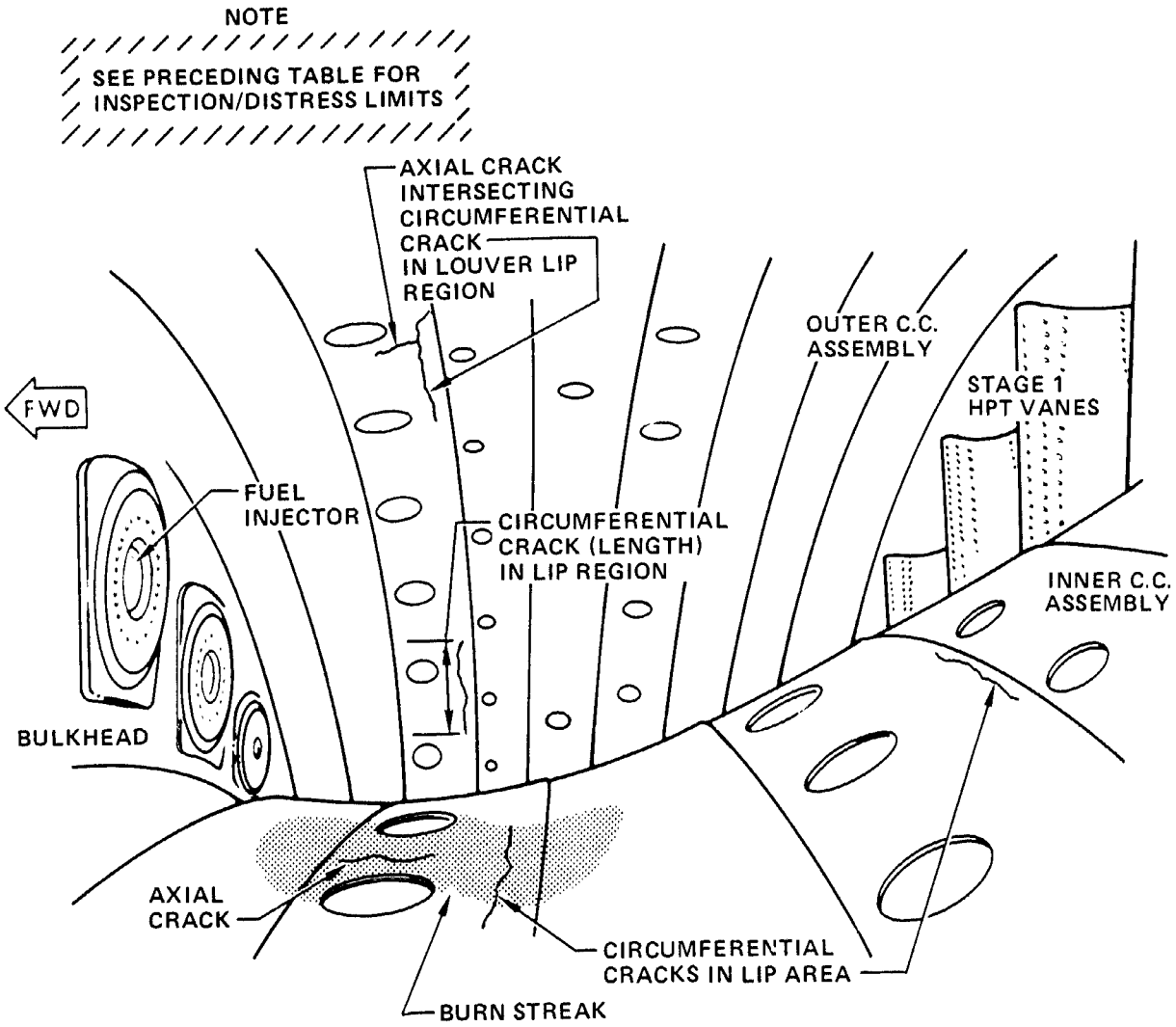

UNACCEPTABLE CONTINUOUS AXIAL CRACK (MORE THAN 3 LOUVERS)
INDIVIDUAL AXIAL CRACKS. THESE CRACKS CAN BE A CONTINUOUS CRACK ON THE ID SIDE.
LOUVER KNUCKLE

OUTER (COLD SIDE) VIEW OF OUTER COMBUSTION CHAMBER
(SAME FOR OUTER (COLD SIDE) OF INNER COMBUSTION CHAMBER)

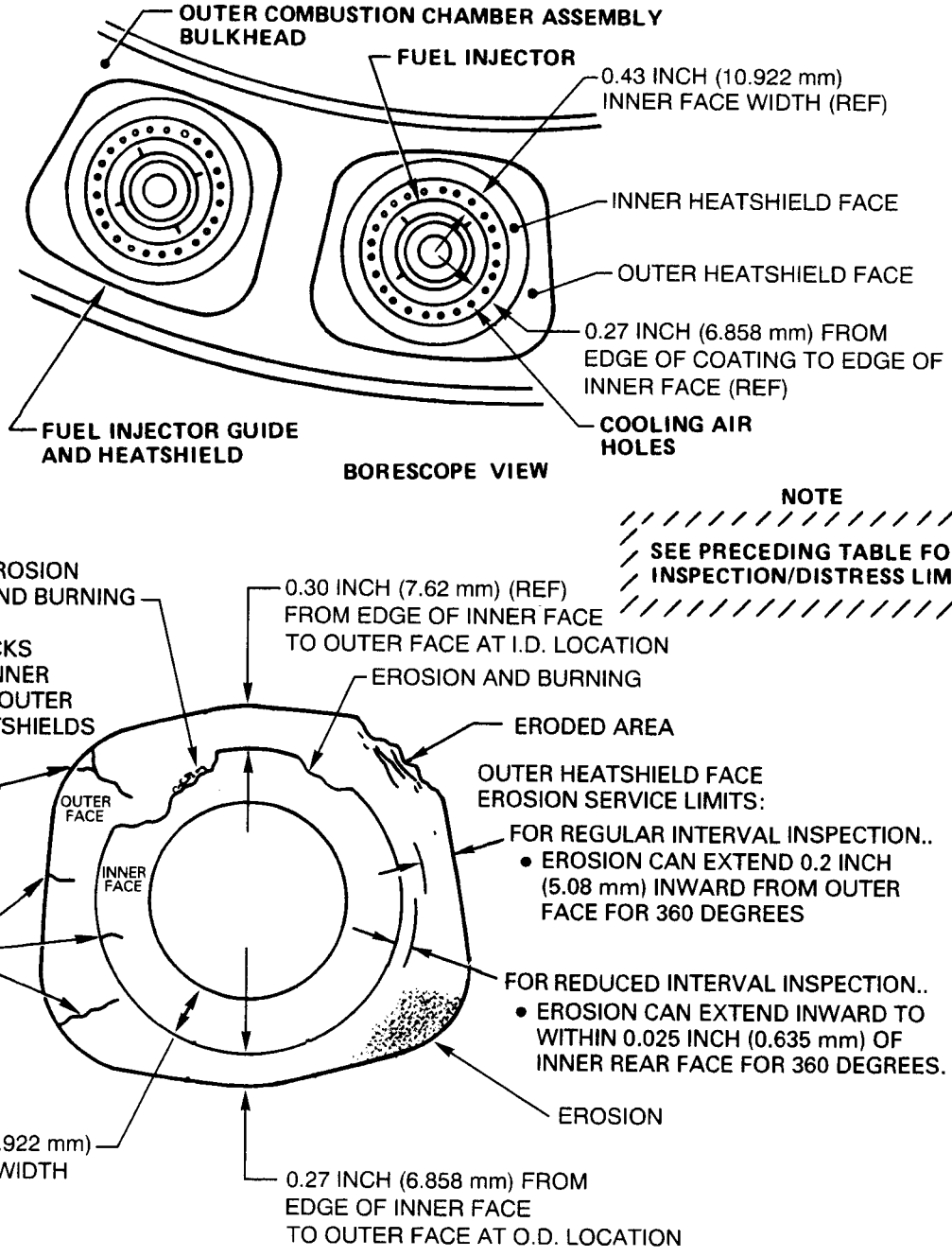
L-B0742 (0298)
PW V

BM5 72 00 00 6 KZUM 01

Combustion Chamber Assembly - Inspection/Distress Limits
(Sheet 2/2)
Figure 637



Combustion Chamber Assembly - Inspection/Distress Limits
Figure 638

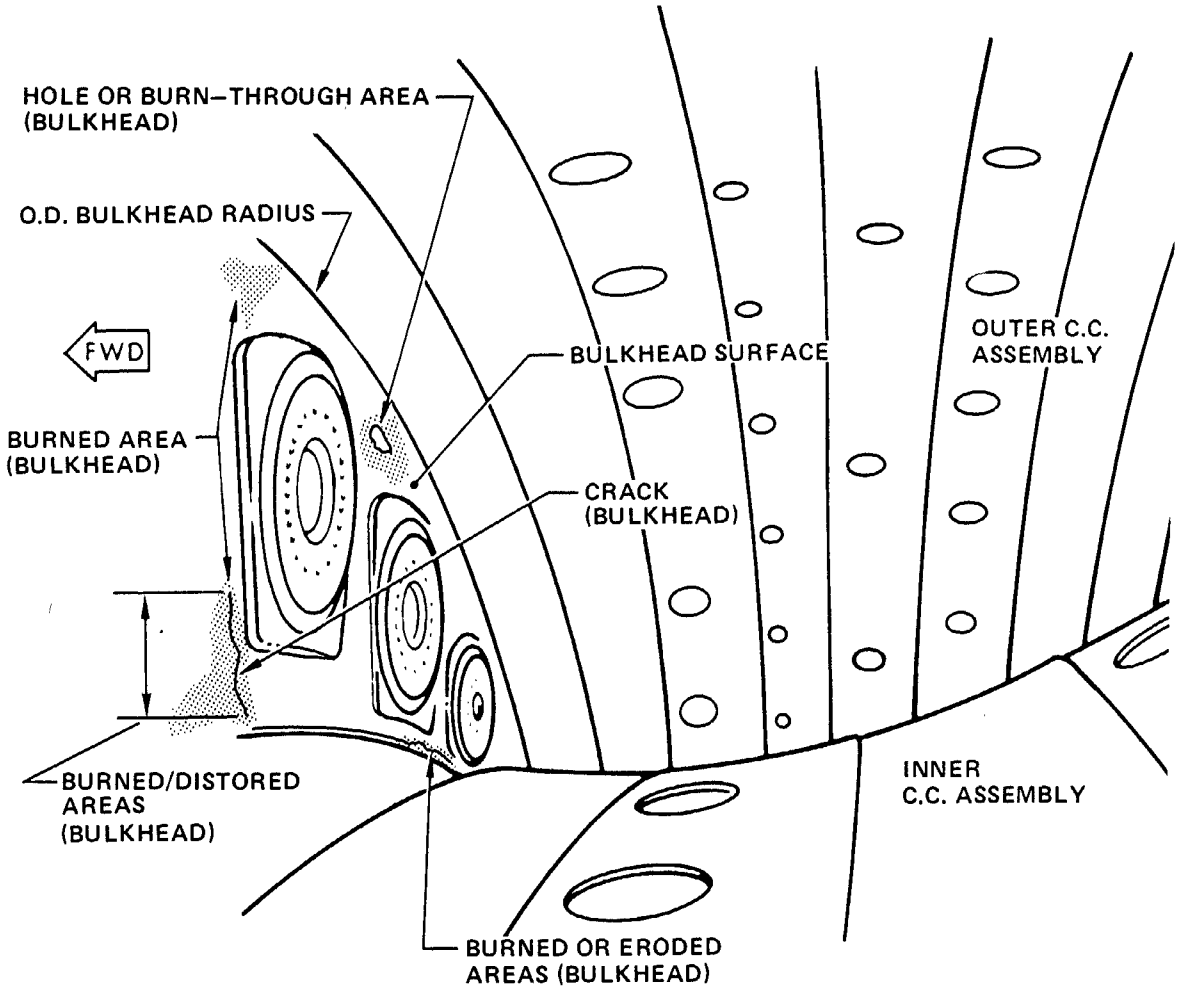

OUTER COMBUSTION CHAMBER ASSEMBLY BULKHEAD
FUEL INJECTOR
0.43 INCH (10.922 mm) INNER FACE WIDTH (REF)
INNER HEATSHIELD FACE
OUTER HEATSHIELD FACE
0.27 INCH (6.858 mm) FROM EDGE OF COATING TO EDGE OF INNER FACE (REF)
FUEL INJECTOR GUIDE AND HEATSHIELD
COOLING AIR HOLES
BORESCOPE VIEW
NOTE
SEE PRECEDING TABLE FOR INSPECTION/DISTRESS LIMITS
EROSION AND BURNING
0.30 INCH (7.62 mm) (REF) FROM EDGE OF INNER FACE TO OUTER FACE AT I.D. LOCATION
CRACKS ON INNER AND OUTER HEATSHIELDS
EROSION AND BURNING
ERODED AREA
OUTER FACE
INNER FACE
OUTER HEATSHIELD FACE EROSION SERVICE LIMITS:
FOR REGULAR INTERVAL INSPECTION..
• EROSION CAN EXTEND 0.2 INCH (5.08 mm) INWARD FROM OUTER FACE FOR 360 DEGREES
FOR REDUCED INTERVAL INSPECTION..
• EROSION CAN EXTEND INWARD TO WITHIN 0.025 INCH (0.635 mm) OF INNER REAR FACE FOR 360 DEGREES.
EROSION
).43 INCH (10.922 mm)
NNER FACE WIDTH
0.27 INCH (6.858 mm) FROM EDGE OF INNER FACE TO OUTER FACE AT O.D. LOCATION
ENLARGED VIEW OF HEATSHIELD AREA (FUEL INJECTOR REMOVED)
L-A3321
(0597)

BM5 72 00 00 6 KCV0 02

Combustion Chamber Assembly - Inspection/Distress Limits
Figure 639

NOTE

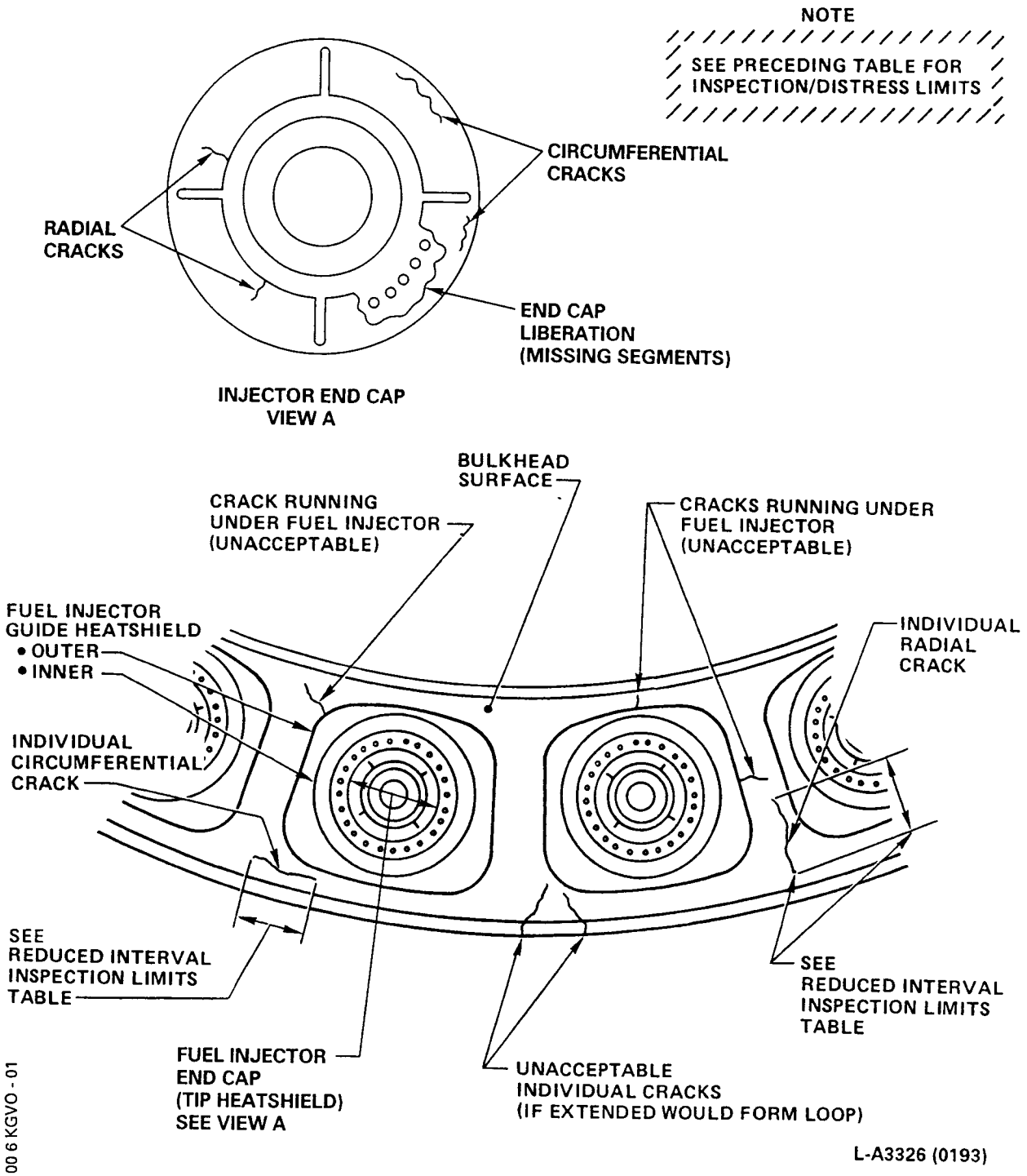
SEE PRECEDING TABLE FOR INSPECTION/DISTRESS LIMITS



BM5 72 00 00 6 KEVO - 23

L – A3323

Combustion Chamber Assembly - Inspection/Distress Limits
Figure 640


NOTE
SEE PRECEDING TABLE FOR INSPECTION/DISTRESS LIMITS
CIRCUMFERENTIAL CRACKS
RADIAL CRACKS
END CAP LIBERATION (MISSING SEGMENTS)
INJECTOR END CAP VIEW A
BULKHEAD SURFACE
CRACK RUNNING UNDER FUEL INJECTOR (UNACCEPTABLE)
CRACKS RUNNING UNDER FUEL INJECTOR (UNACCEPTABLE)
FUEL INJECTOR GUIDE HEATSHIELD
• OUTER
• INNER
INDIVIDUAL RADIAL CRACK
INDIVIDUAL CIRCUMFERENTIAL CRACK
SEE REDUCED INTERVAL INSPECTION LIMITS TABLE
SEE REDUCED INTERVAL INSPECTION LIMITS TABLE
FUEL INJECTOR END CAP (TIP HEATSHIELD) SEE VIEW A
UNACCEPTABLE INDIVIDUAL CRACKS (IF EXTENDED WOULD FORM LOOP)
L-A3326 (0193)
BM5 72 00 00 6 KGVO - 01

Combustion Chamber Assembly - Inspection/Distress Limits
Figure 641

5. Perform Borescope Inspection of Stage 1 HPT Vanes (AP-8/AP-9)

A. Equipment and Materials
NOTE : See paragraph 1. B. for borescope equipment.
NOTE : See paragraph 1. C. for high rotor rotating equipment.

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
(2)	Torque Wrench
(3)	Washer
(4)	Corrosion Resistant Steel Lockwire (Ref. 70-00-00) (AS3214-02)
(5)Material No.P06-023	Lubricants (Ref. 70-00-00)
(6)PWA86411	Guide Tube, AP-8 Port (for flexible borescope)
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure (Ref. Fig. 642, 643)
(1)Remove plug and washer from borescope access port number A-9, located on the rear of the diffuser case at the 3 o'clock location. See Table 601 for additional AP-9 borescope access port data.
(a)Make an inspection of the AP-9 plug. Measure the shaft diameter for wear. If the shaft diameter minimum dimension is less than 0.100 in. (2.540 mm), the AP-9 plug must be replaced.
(2)Refer to preceding paragraph and remove plugs and gasket from AP-8 borescope access ports.
(a)Put PWA86411 Guide Tube through the diffuser case access port at the AP-8 location with the tip pointed toward the front of the engine. Turn and position the tube such that the flexible borescope, when installed, will point rearwards towards the first stage nozzle guide vanes. Lock the guide tube in position by use of the compression nut.
CAUTION : TEMPERATURES IN AREAS TO BE BORESCOPED SHOULD BE PERMITTED TO COOL BELOW 150°F (65.6°C) FOLLOWING ENGINE OPERATION.
DAMAGE MAY RESULT TO BORESCOPE EQUIPMENT IF EQUIPMENT IS EXPOSED TO GASPATH OR METAL TEMPERATURES IN EXCESS OF 150°F (65,6°C).
AS A GUIDE, IF ADJACENT CASES ARE TO HOT TO TOUCH COMFORTABLY, BORESCOPE INSPECTION SHOULD BE DELAYED.
(3)Insert appropriate borescope through port and inspect Stage 1 HPT vanes for nicks, dents, base material breakthrough/burnthrough, cracks, burning, erosion, coating loss, blocked cooling air holes, sulfidation and damage caused by passage of foreign material.
NOTE : Maximum borescope insertion depth and borescope limiting access hole diameter specifications for AP-8 and AP-9 are provided in

Table 601.

(4)Borescope inspection limits for Stage 1 vanes.

CAUTION : FOLLOWING LIMITS ARE APPLICABLE ON A CONTINUE-IN-SERVICE BASIS ONLY. LIMIT IS BASED ON PART STRUCTURAL REQUIREMENTS AND DOES NOT IMPLY THAT ENGINE PERFORMANCE, STABILITY, OPERATING LIMITS, OR PART REPARABILITY WILL BE MAINTAINED.

(a)Limits for vane conditions observed during borescope inspection are given in below table and in (Ref. Fig. 644, 645, 646).
(Ref. Fig. 647, 648, 649)
(Ref. Fig. 650)

NOTE 1 : (Ref. Fig. 644)
NOTE 2 : (Ref. Fig. 645)
NOTE 3 : (Ref. Fig. 646)
NOTE 4 : (Ref. Fig. 647)
NOTE 5 : (Ref. Fig. 648)
NOTE 6 : (Ref. Fig. 649)
NOTE 7 : (Ref. Fig. 650)

OBSERVED CONDITION	EXAMINE	DAMAGE	DISPOSITION
Nicks and dents (See NOTE 1)	Leading edge, concave and convex airfoils, ID and OD platforms	Nicks and round bottomed dents (2) to 0.125 in. (3.175 mm) in length or diameter are permitted. NOTE : IF the view angle is such that the depth can be determined, the maximum nick and round bottom dent depth is 0.0312 in. (0.79 mm).	Permitted for regular inspection interval.
	Trailing edge	Two nicks or dents (1) maximum on the trailing edge, separated by at least 0.750 in. (19.050 mm). Five vanes maximum on each engine.	Permitted for regular inspection interval.
		More than the above interval inspection limits.	Remove engine in 5 cycles maximum or less.
Damaged or missing thermal barrier	Leading edge, concave and convex airfoils, ID and	No limit on the quantity of chipped coating, coating loss, checking, crazed or	Permitted for regular inspection interval.

OBSERVED CONDITION	EXAMINE	DAMAGE	DISPOSITION
coating (see NOTE 1)	OD platforms, trailing edge	cracked thermal barrier coating. See (3) and (4). NOTE : If a large quantity of thermal barrier coating is missing, and the vane is operated for a long time, it is possible that the vane cannot be repaired at overhaul. The vane base metal can become burned and eroded.	
Burning and erosion (see NOTE 2)	Leading edge, concave and convex airfoils, ID and OD platforms, trailing edge	No limit on the quantity of burning (1) and erosion (2) as long as it is not burned completely through the wall. See (1), (2) and (3).	Permitted for regular inspection interval.
Material breakthrough or burnthrough (see NOTE 3)	Leading edge, concave and convex airfoils, ID and OD platforms	One material breakthrough or burnthrough (2) with an open area (material that is not there) to 0.157 in. (3.988 mm) diameter or 0.019 sq.in. (12.0 sq.mm).	Permitted for regular inspection interval.
		One material breakthrough or burnthrough (1) and (4) with an open area (material that is not there) more than 0.157 in. (3.988 mm) but less than 0.300 in. (7.620 mm) diameter or to 0.070 sq.in. (45.0 sq.mm) maximum.	Permitted for 300 cycle reduced inspection interval.
		A maximum of five	Permitted for

OBSERVED CONDITION	EXAMINE	DAMAGE	DISPOSITION
		vanes for each engine with one material breakthrough or burnthrough (1), (4) and (6) more than 0.300 in. (7.620 mm) but less than 0.500 in. (12.700 mm) diameter or 0.196 sq.in. (126.0 sq.mm) into the internal cavity.	300 cycle reduced inspection interval.
		More than 5 vanes with one material breakthrough or burnthrough (1) and (6) more than 0.300 in. (7.620 mm) but less than 0.500 in. (12.700 mm) diameter or up 0.196 sq.in. (126.0 sq.mm) maximum.	Permitted for 150 cycle reduced inspection interval.
		For leading edge burnthrough more than 0.500 in. (12.700 mm) diameter : No limit on the number of vanes with leading edge burnthrough to 1.614 in. (40.996 mm) maximum radial length that does not go axially more than the first row of concave side cooling holes and does not go axially more than the second row of convex side cooling holes is permitted if there is no burning on the internal baffle.	Permitted for 50 cycle reduced inspection interval.
		Vane baffle burned through.	Not permitted.

OBSERVED CONDITION	EXAMINE	DAMAGE	DISPOSITION
		More than the above interval inspection limits.	Remove engine in 5 cycles maximum or less.
	Concave side trailing edge	Burnthrough (3) less than 75% span of axial length from the trailing edge to the rear cooling holes and up 1.575 in. (40.005 mm) maximum width.	Permitted for regular inspection interval.
		Burnthrough (5) more than 75% span of axial length from the trailing edge to the rear cooling holes and to 1.575 in. (40.005 mm) maximum width.	Permitted for 300 cycle reduced inspection interval.
		Burnthrough (7) to 0.512 in. (13 mm) forward of the rear two rows of cooling holes and up to 1.575 in. (40.005 mm) maximum width.	Permitted for 150 cycle reduced inspection interval.
		Burnthrough more than 0.511 in. (12.979 mm) forward of the rear two rows of cooling holes, or is more than 1.575 in. (40.005 mm) in width, or if the internal baffle is burned through.	Remove engine in 5 cycles maximum or less.
	Convex side trailing edge	Burnthrough (8) less than 50% span from the trailing edge to the rear cooling holes.	Permitted for regular inspection interval.
		Burnthrough (9) more than 50% span from the trailing edge to the	Permitted for 150 cycle reduced inspection interval.

OBSERVED CONDITION	EXAMINE	DAMAGE	DISPOSITION
		rear cooling holes. Burnthrough is forward of the rear cooling holes.	Remove engine in 5 cycles maximum or less.
Cracks, axial and radial	Leading edge surface (See NOTE 4)	No limit on the quantity of tight cracks (3). Closed loop cracks (4) are not permitted.	Permitted for regular inspection interval.
		One crack (5) in each vane starting at the ID or OD platform, to a maximum height of 0.500 in. (12.700 mm).	Permitted for regular inspection interval.
		A maximum of 3 cracks in each vane (1) which go to a concave or convex airfoil cooling hole. Closed loop cracks (4) are not permitted.	Permitted for regular inspection interval.
		Two cracks (2) in each vane starting at the ID or OD platforms, to a maximum height of 0.750 in. (19.050 mm).	Permitted for 300 cycle reduced inspection interval.
		More than the above interval inspection limits.	Remove engine in 5 cycles maximum or less.
	Concave airfoil surface (See NOTE 5)	No limit on the quantity of axial (1) or radial cracks (1A) less than 0.157 in. (3.988 mm) are permitted. Closed loop cracks (4) are not permitted. NOTE : A crack or part length of a crack that has	Permitted for regular inspection interval.

OBSERVED CONDITION	EXAMINE	DAMAGE	DISPOSITION
		burned or eroded to a width more than 0.050 in. (1.27 mm) must be identified as a hole. The breakthrough or burnthrough limits apply.	
		A maximum of three axial cracks (2) that go from one cooling hole group to the next cooling hole group or from the trailing edge to the rear cooling hole group are permitted. One of the above three axial cracks can go forward or rearward to the next cooling hole group or from the trailing edge through the rear cooling hole group to the next cooling hole group.	Permitted for regular inspection interval.
		No limit on the quantity of axial cracks (6) that go from one cooling hole group to the next cooling hole group or from the trailing edge to the rear cooling hole group if the cracks do not form a closed loop.	Permitted for 300 cycle reduced inspection interval.
		Radial cracks (3) that go from the ID or OD platform to the concave airfoil are permitted. The maximum crack length on the airfoil from the	Permitted for regular inspection interval.

OBSERVED CONDITION	EXAMINE	DAMAGE	DISPOSITION
		platform is 0.500 in. (12.700 mm). Cracks from a platform that go to the airfoil surface cannot intersect other cracks on the airfoil surface.	
		Radial cracks (8) that go from the ID or OD platform to the concave airfoil surface more than 0.500 in. (12.700 mm) but less than 0.800 in. (20.320 mm). Cracks from a platform that go to the airfoil surface cannot intersect other cracks on the airfoil surface.	Permitted for 300 cycle reduced inspection interval.
		Three radial cracks (1A) maximum to 0.500 in. (12.700 mm) maximum length are permitted.	Permitted for regular inspection interval.
		No limit on the quantity of radial cracks (6A) to 0.800 in. (20.320 mm) length.	Permitted for 300 cycle reduced inspection interval.
		A crack (5) can intersect with another crack, except for cracks that start at the ID or OD platform. The maximum length for either crack leg is 0.400 in. (10.160 mm). The intersection of platform cracks with airfoil cracks is not permitted.	Permitted for regular inspection interval.

OBSERVED CONDITION	EXAMINE	DAMAGE	DISPOSITION
		An intersecting crack (7) with a leg more than 0.400 in. (10.160 mm) and less than 0.800 in. (20.320 mm) except for cracks that start at the ID or OD platform. The instersection of platform cracks with airfoil cracks is not permitted.	Permitted for 300 cycle reduced inspection interval.
		More than the above interval inspection limits.	Remove engine in 5 cycles maximum or less.
	Convex airfoil surface (See NOTE 6)	No limit on the quantity of axial (1) or radial cracks (1A) less than 0.157 in. (3.988 mm) are permitted. Closed loop cracks (5) are not permitted. NOTE : A crack or part length of a crack that has burned or eroded to a width more than 0.05 in. (1.27 mm) must be identified as a hole. The breakthrough or burnthrough limits apply.	Permitted for regular inspection interval.
		Three axial cracks maximum to 0.500 in. (12.700 mm) maximum length except as follows : One of the three axial cracks (3) can traverse from the trailing edge for a	Permitted for regular inspection interval.

OBSERVED CONDITION	EXAMINE	DAMAGE	DISPOSITION
		maximum distance of 0.750 in. (19.050 mm).	
		Six axial cracks (6) maximum to 0.800 in. (20.320 mm) maximum length except as follows : One of the six axial cracks (8) can traverse from the trailing edge for a maximum distance of 1.300 in. (33.020 mm), or to the last row of cooling holes.	Permitted for 300 cycle reduced inspection interval.
		One axial crack (3) from the trailing edge to a maximum of 1.181 in. (29.997 mm).	Permitted for regular inspection interval.
		One axial crack (8) from the trailing edge more than 1.181 in. (29.997 mm) to 2.362 in. (59.995 mm) maximum is permitted.	Permitted for 300 cycle reduced inspection interval.
		Three radial cracks (1A) to 0.500 in. (12.700 mm) maximum length.	Permitted for regular inspection interval.
		No limit on the quantity of radial cracks (6A) to 0.800 in. (20.320 mm) length.	Permitted for 300 cycle reduced inspection interval.
		A crack can intersect with another crack (4) except for cracks that start at the ID or OD platforms. The maximum length for either crack leg	Permitted for regular inspection interval.

OBSERVED CONDITION	EXAMINE	DAMAGE	DISPOSITION
		is 0.500 in. (12.700 mm). Intersection of platform cracks with airfoil cracks is not permitted.	
		An intersecting crack (9) with a leg more than 0.500 in. (12.700 mm) and less than 0.800 in. (20.320 mm) except for cracks that start at the ID or OD platform. Instersection of platform cracks with airfoil cracks is not permitted.	Permitted for 300 cycle reduced inspection interval.
		Radial cracks (2) that go from the ID or OD platform to the convex airfoil are permitted. The maximum crack length on the airfoil from the platform is 0.500 in. (12.700 mm). Cracks from a platform (2) that go to the airfoil surface cannot inter-sect other cracks on airfoil surface.	Permitted for regular inspection interval.
		Radial cracks (7) that go from the ID or OD platform to the convex airfoil surface more than 0.500 in. (12.700 mm) but less than 0.800 in. (20.320 mm) are permitted. Cracks from a platform that go to the airfoil surface cannot inter-sect other cracks on	Permitted for 300 cycle reduced inspection interval.

OBSERVED CONDITION	EXAMINE	DAMAGE	DISPOSITION
		airfoil surface. More than the above interval inspection limits.	Remove engine in 5 cycles maximum or less.
	ID and OD platform surfaces (buttresses) (see NOTE 7)	No limit on the quantity of cracks less than 0.250 in. (6.350 mm) in length on the platform surfaces are permitted. Intersecting cracks are permitted if no closed loop is formed. Closed loop cracks are not permitted. NOTE : A crack or part length of a crack that has burned or eroded to a width of more than 0.05 in. (1.27 mm) must be identified as a hole. The breakthrough or burnthrough limits apply.	Permitted for regular inspection interval.
		Four cracks (4) maximum more than 0.250 in. (6.350 mm) long are permitted on the OD platform concave airfoil side. Three of the cracks can be up to 0.700 in. (17.780 mm) long, and one crack can be to (no length limit). These cracks can go to the airfoil concave surface to a height of 0.500 in. (12.70 mm).	Permitted for regular inspection interval.

OBSERVED CONDITION	EXAMINE	DAMAGE	DISPOSITION
		Six cracks (9) maximum more than 0.250 in. (6.350 mm) long are permitted on the OD platform concave airfoil side. Four of the cracks can be up to 0.700 in. (17.780 mm) long, and two of the cracks can be to (no length limit). These cracks can go to the airfoil concave surface to a height of 0.800 in. (20.320 mm).	Permitted for 300 cycle reduced interval.
		Two cracks (4A) more than 0.250 in. (6.350 mm) long are permitted on the OD platform convex airfoil side, from the airfoil fillet to platform edge.	Permitted for regular inspection interval.
		Four cracks (9A) more than 0.250 in. (6.350 mm) long are permitted on the OD platform convex airfoil side, from the airfoil fillet to platform edge.	Permitted for 300 cycle reduced inspection interval.
		Two cracks (4B) more than 0.250 in. (6.350 mm) long are permitted on the ID platform, concave or convex airfoil side, from the airfoil fillet to platform edge.	Permitted for regular inspection interval.
		Four cracks (9B) more than 0.250 in.	Permitted for 300 cycle reduced

OBSERVED CONDITION	EXAMINE	DAMAGE	DISPOSITION
		(6.350 mm) long are permitted on the ID platform, concave or convex airfoil side, from the airfoil fillet to platform edge.	inspection interval.
		One crack (1) maximum for each side and two cracks total for each vane in the ID or OD fillet radius that goes parallel or axially along the fillet radius surface. The maximum length is 0.600 in. (15.240 mm). Airfoil/platform fillet radius cracks can intersect other cracks, if the total length is less than 1.0 in. (25.400 mm). No circumferential cracks in the leading edge fillet.	Permitted for regular inspection interval.
		One crack (6) maximum for each side and two cracks total for each vane in the ID or OD fillet radius that goes parallel or axially along the fillet radius surface. The maximum length is 1.000 in. (25.400 mm). Airfoil/platform fillet radius cracks can intersect other cracks, if the total length is less than 1.750 in. (44.450 mm). On crack maximum in the ID or OD leading edge fillet radius surface (8) that goes	Permitted for 300 cycle reduced inspection interval.

OBSERVED CONDITION	EXAMINE	DAMAGE	DISPOSITION
		circumferentially around the leading edge to a length of 0.400 in. (10.160 mm) maximum.	
		More than the above interval inspection limits.	Remove engine in 5 cycles maximum or less.

(5)After borescope inspection, reinstall AP-9 plug and new washer per requirements of Table 605.

CAUTION : MAKE CERTAIN THAT BORESCOPE PLUGS ARE CORRECTLY INSTALLED. A MISSING PLUG CAN CAUSE IMPORTANT DAMAGE TO COMPONENTS AND/OR NACELLE STRUCTURE.

AP9 Borescope Plug Installation Data
Table 605

AP Number and Location	Washer Required	Plug Locking Method	Plug Replacement Lubricant	Plug Torque lbf. in. (m.daN)
AP-9 Rear of Diffuser Case	Yes PN 584977	Lockwire (AS3214-02)	P06-023 Lubricants (Ref. 70-00-00)	40-50 (0.45-0.56)

(6)Reinstall AP-8 plugs,

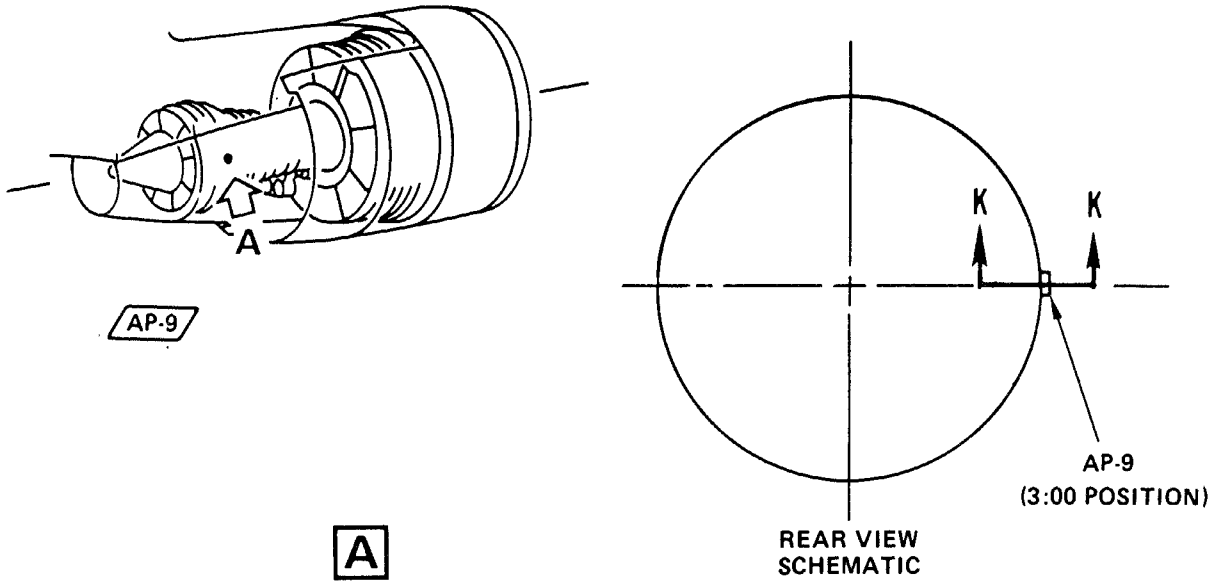
CAUTION : MAKE CERTAIN THAT BORESCOPE PLUGS ARE CORRECTLY INSTALLED. A MISSING PLUG CAN CAUSE IMPORTANT DAMAGE TO COMPONENTS AND/OR NACELLE STRUCTURE.

(a)Refer to preceding para. and reinstall AP-8 plugs and gaskets per installation instructions in table 604.

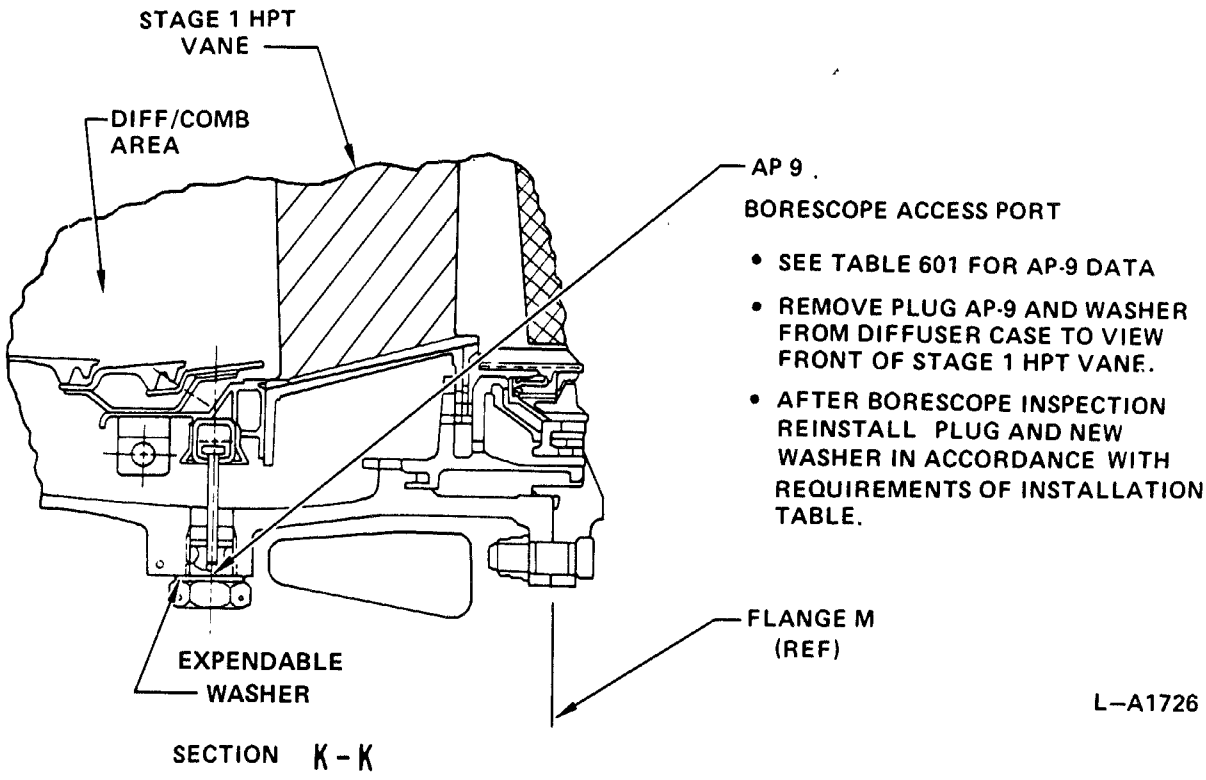
D. Close-Up

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)Close fan and thrust reverser cowl doors. Remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

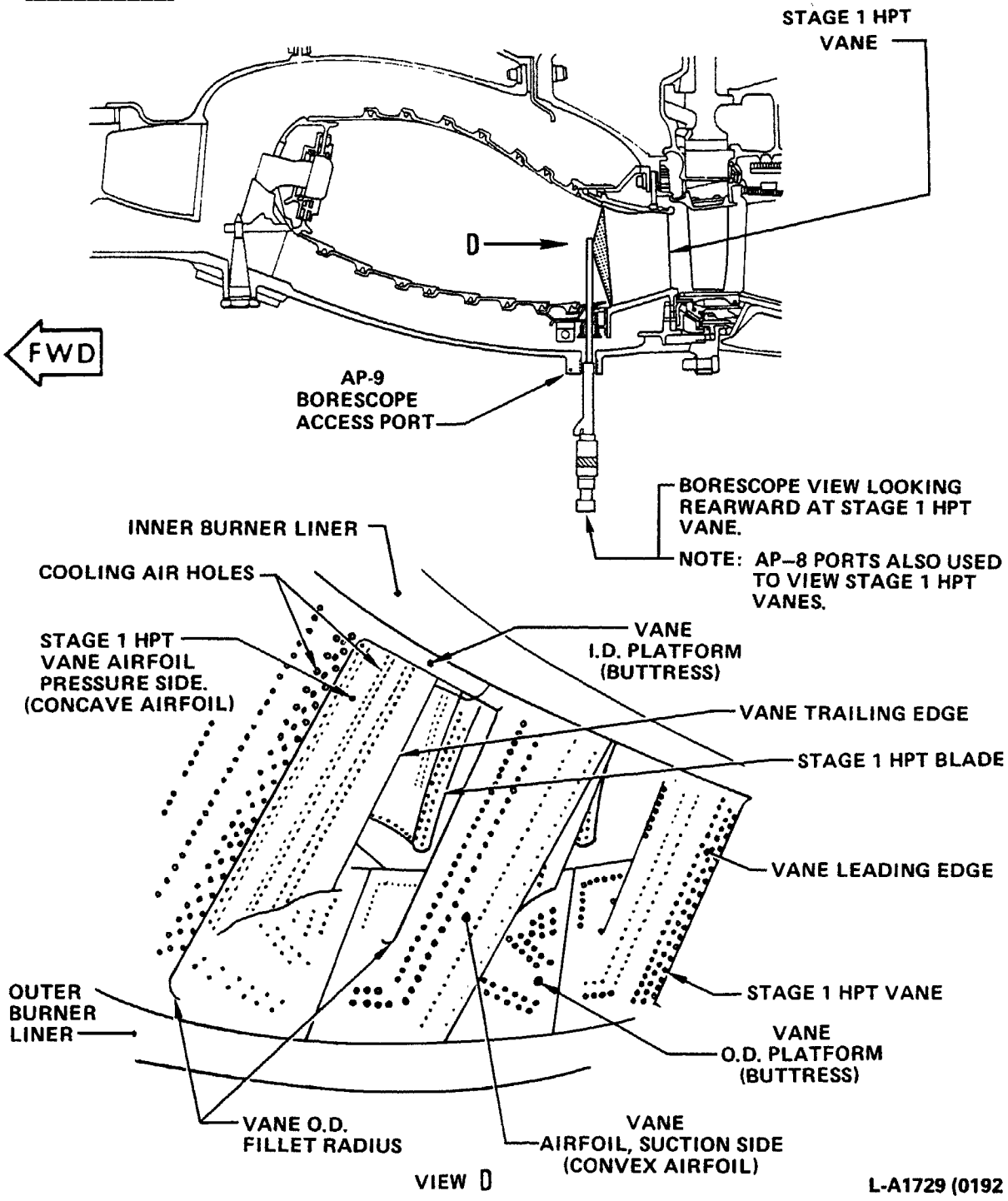


A



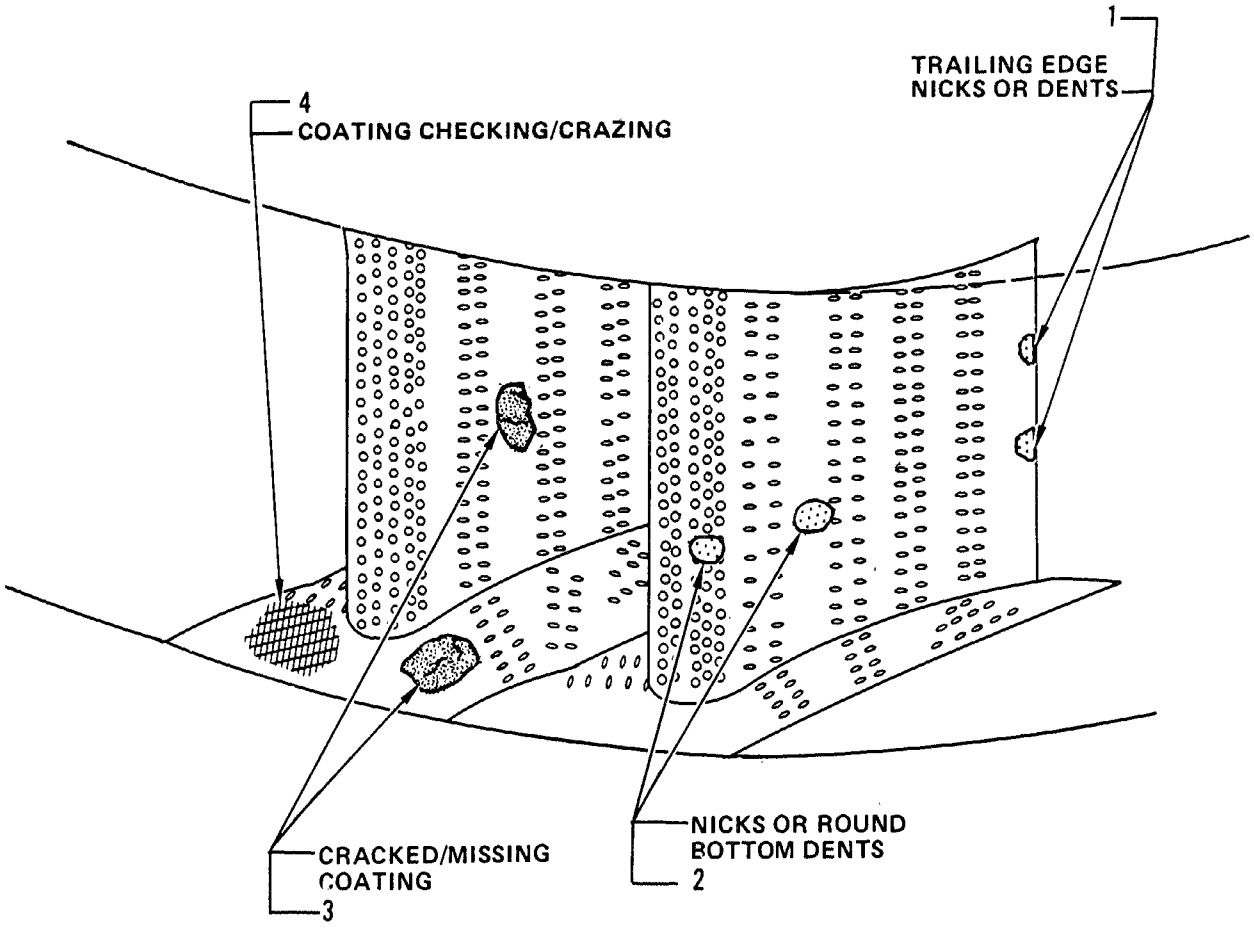
BM5 72 00 00 6 KNRO - 21

Stage 1 HPT Vane Borescope Access Port (AP-9) Location
Figure 642


STAGE 1 HPT VANE
D
FWD
AP-9 BORESCOPE ACCESS PORT
BORESCOPE VIEW LOOKING REARWARD AT STAGE 1 HPT VANE.
NOTE: AP–8 PORTS ALSO USED TO VIEW STAGE 1 HPT VANES.
INNER BURNER LINER
COOLING AIR HOLES
STAGE 1 HPT VANE AIRFOIL PRESSURE SIDE. (CONCAVE AIRFOIL)
VANE I.D. PLATFORM (BUTTRESS)
VANE TRAILING EDGE
STAGE 1 HPT BLADE
VANE LEADING EDGE
OUTER BURNER LINER
STAGE 1 HPT VANE
VANE O.D. PLATFORM (BUTTRESS)
VANE O.D. FILLET RADIUS
VANE AIRFOIL, SUCTION SIDE (CONVEX AIRFOIL)
VIEW D
L-A1729 (0192

BM5 72 00 00 6 KNPO - 01

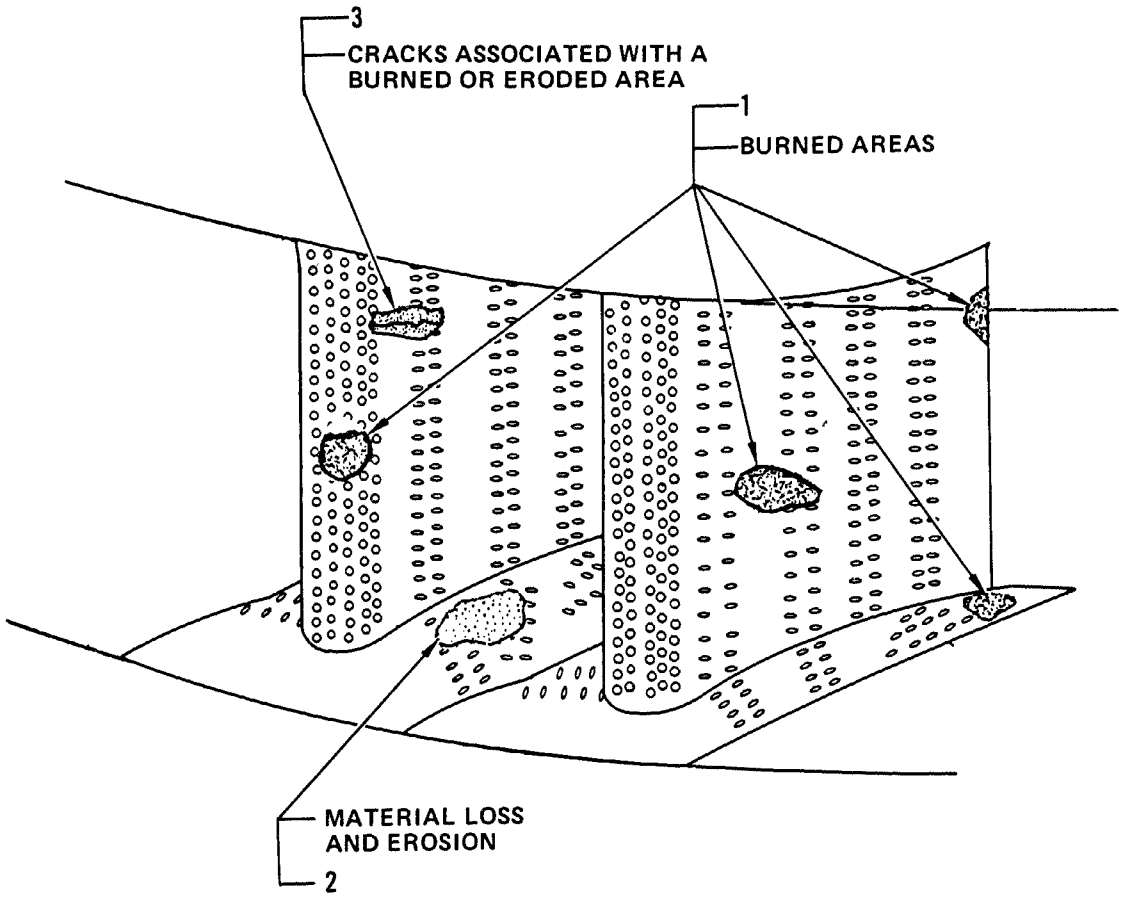
Borescope Viewing of Stage 1 HPT Vanes (AP-8 and AP-9)
Figure 643



BM5 72 00 00 6 KEPO .21

L-A1742

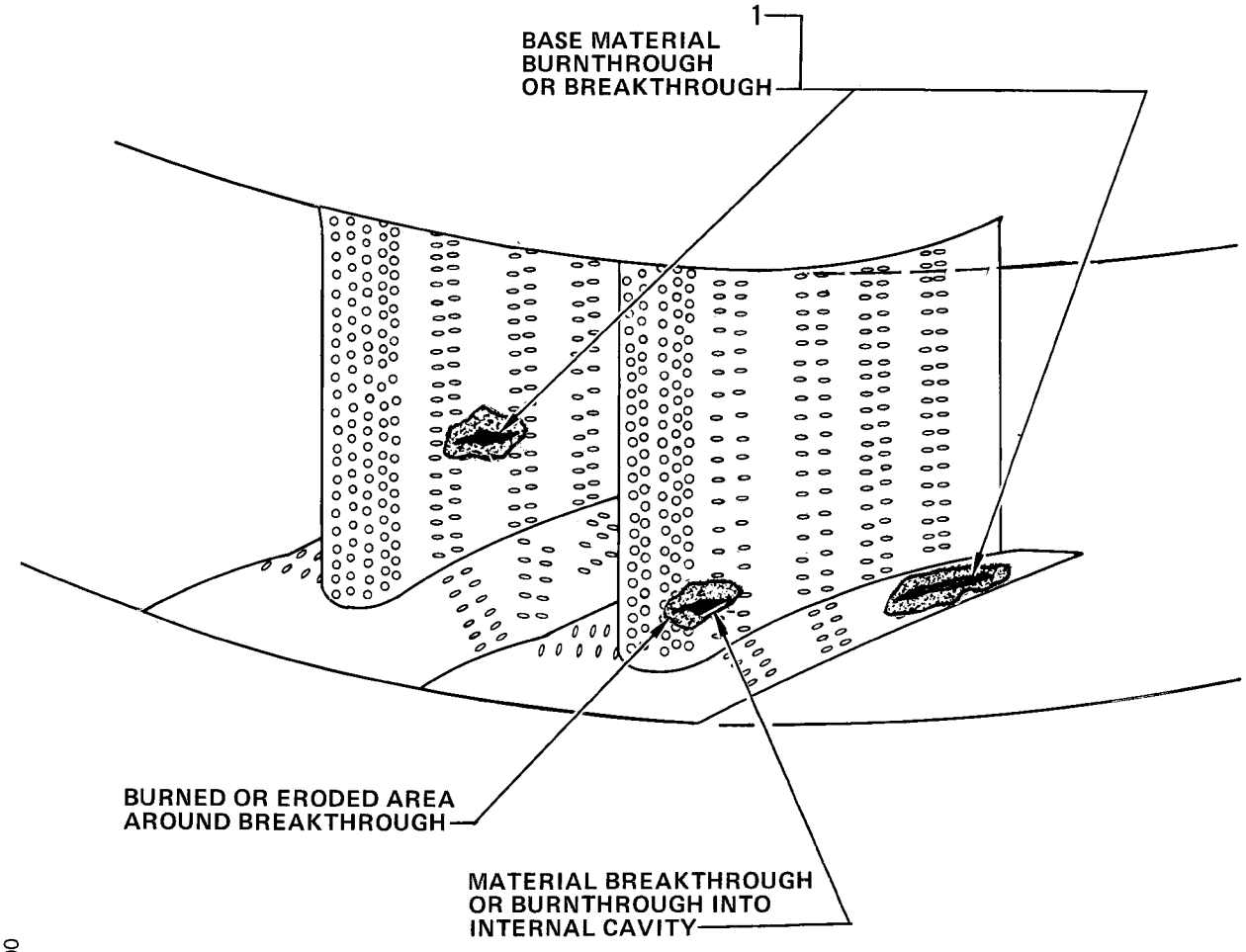
Stage 1 HPT Vane Observed Damage - Nicks/Dents/
Coating Loss
Figure 644



BM5 72 00 00 6 KGPO - 21

L-A1737

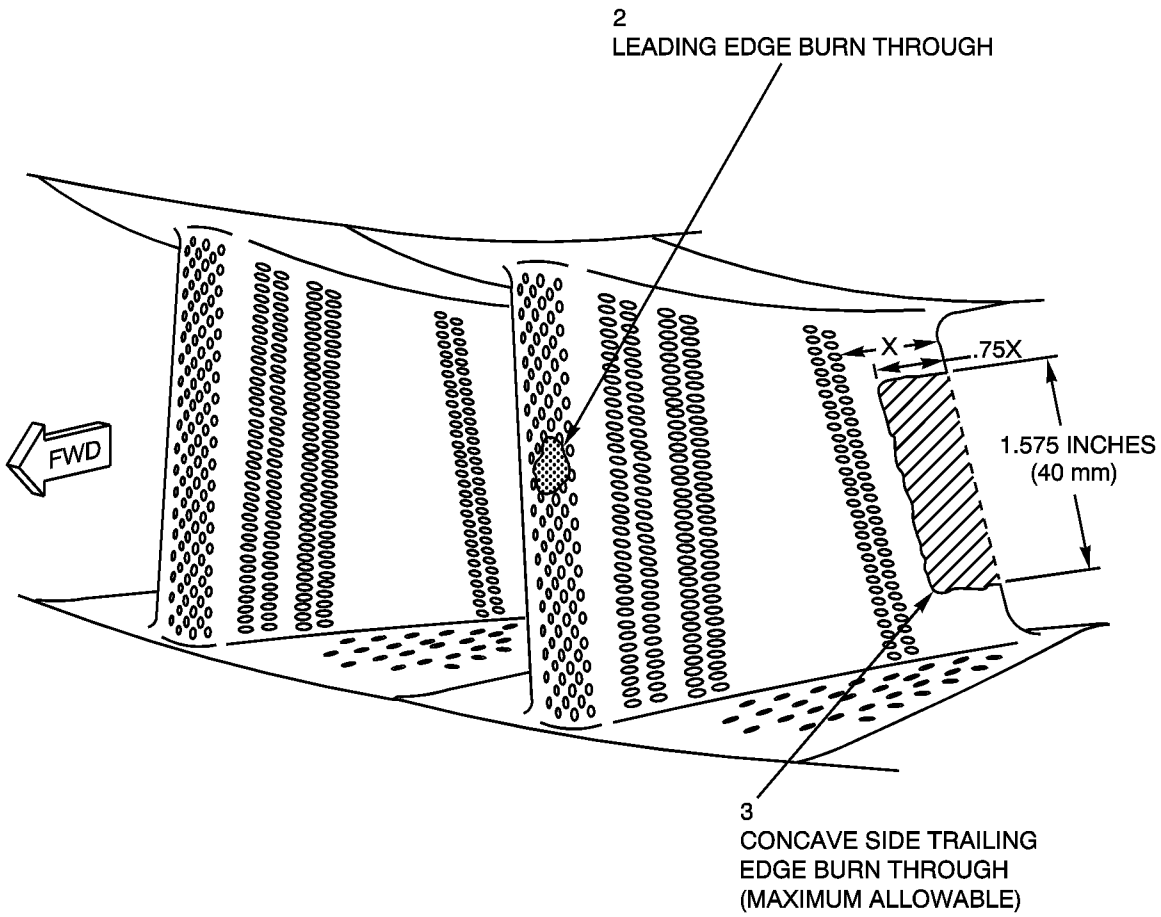
Stage 1 HPT Vane Observed Damage - Burning/Erosion/ Material Loss
Figure 645



BM5 72 00 00 6 KJPA 00

L–A1738

Stage 1 HPT Vane Observed Damage - Base Material Burnthrough (AP-8 or AP-9 Viewing) (Sheet 1/6)
Figure 646

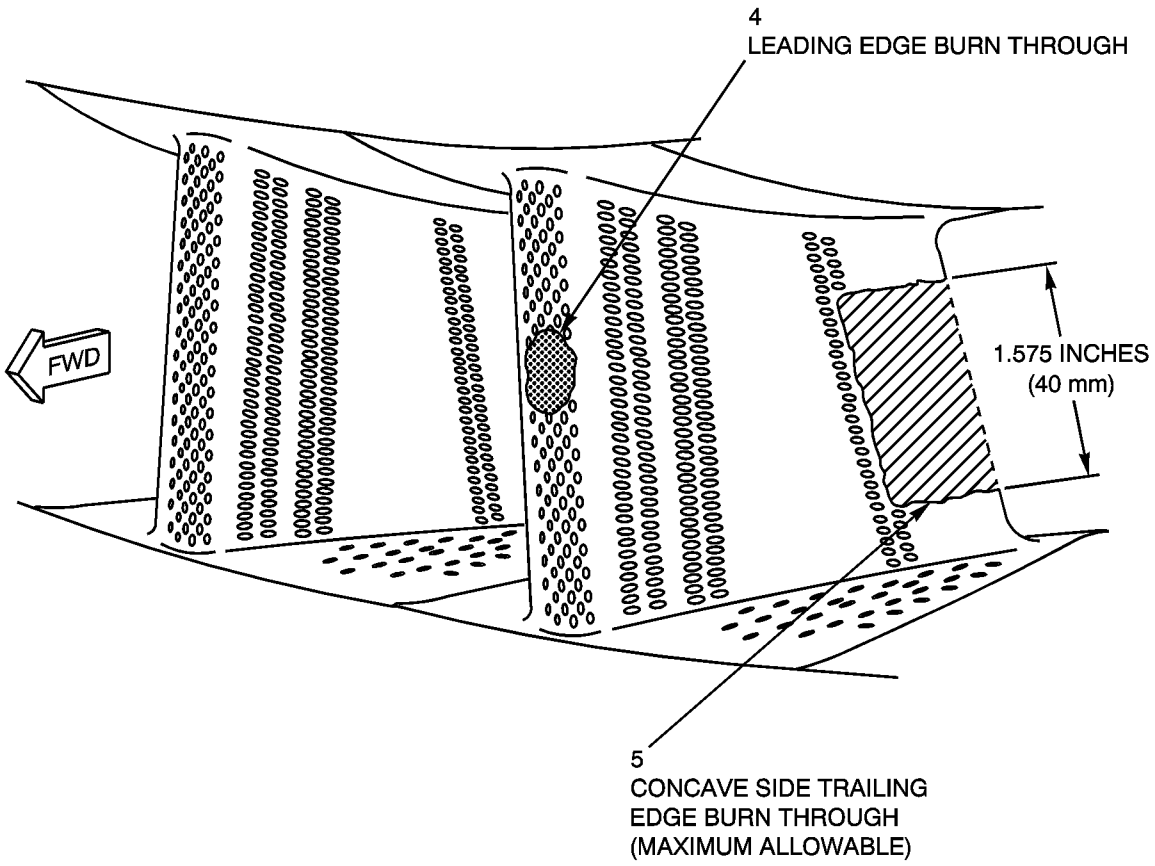


LEADING EDGE AND CONCAVE SIDE
REGULAR INSPECTION INTERVAL

BM5 72 00 00 6 KJPB 00

L-D3525 (0907)
PW V

Leading Edge and Concave Side Trailing
Edge Inspection Interval (Regular Inspection) (Sheet 2/6)
Figure 646

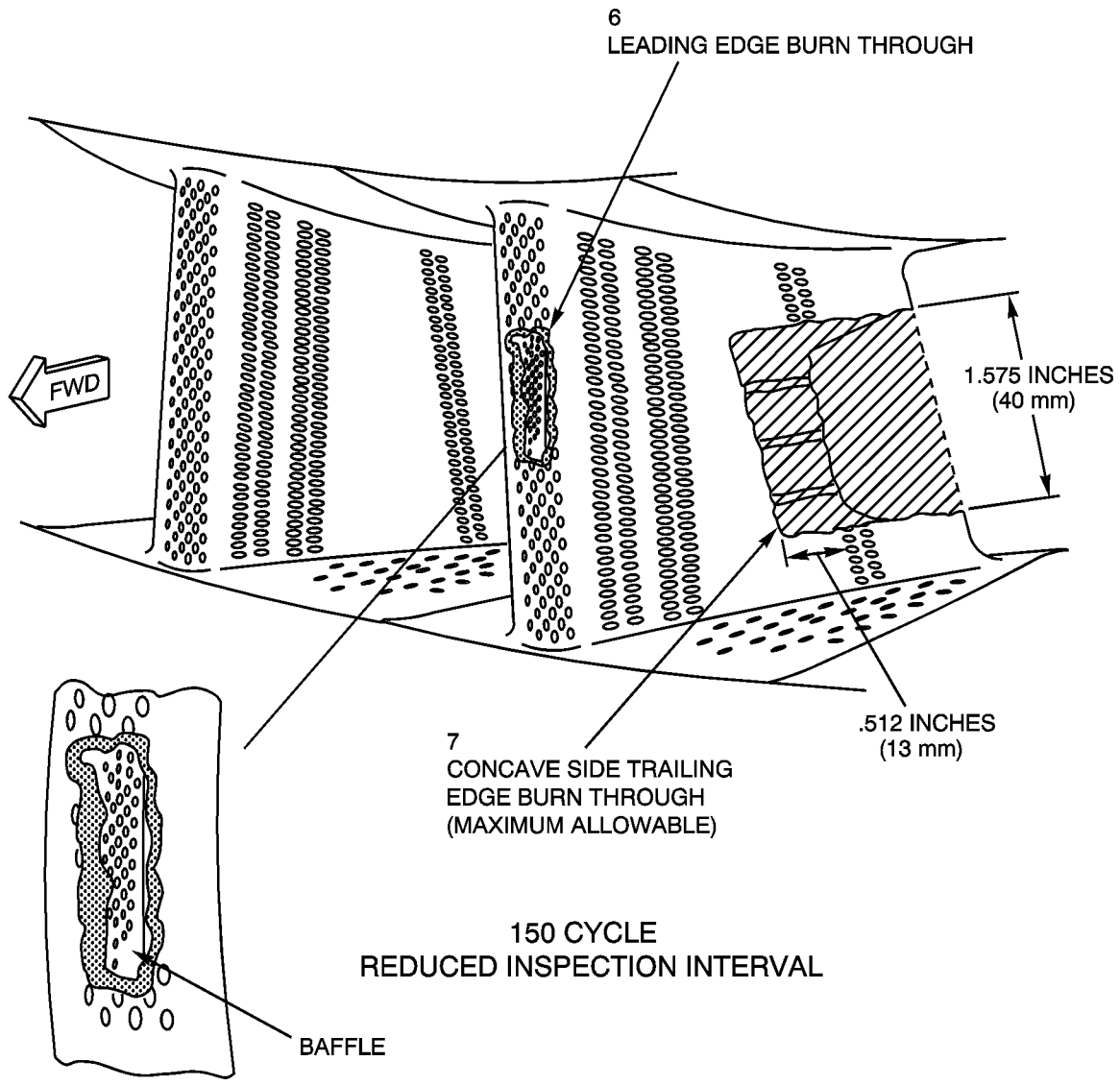


300 CYCLE
REDUCED INSPECTION INTERVAL

BM5 72 00 00 6 KJPC 00

L-D3526 (0907)
PW V

Leading Edge and Concave Side Trailing
Edge Reduced Inspection Interval (300 Cycle) (Sheet 3/6)
Figure 646

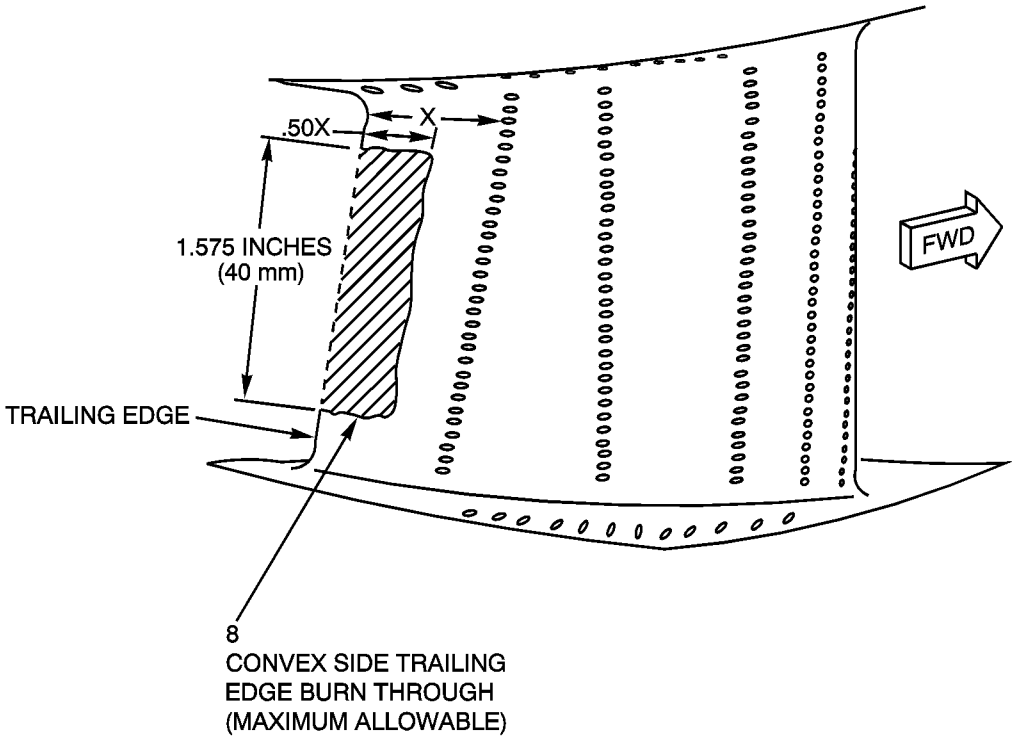


150 CYCLE
REDUCED INSPECTION INTERVAL

BM5 72 00 00 6 KJPD 00

L-D3527 (0907)
PW V

Leading Edge and Concave Side Trailing
Edge Reduced Inspection Interval (150 Cycle) (Sheet 4/6)
Figure 646

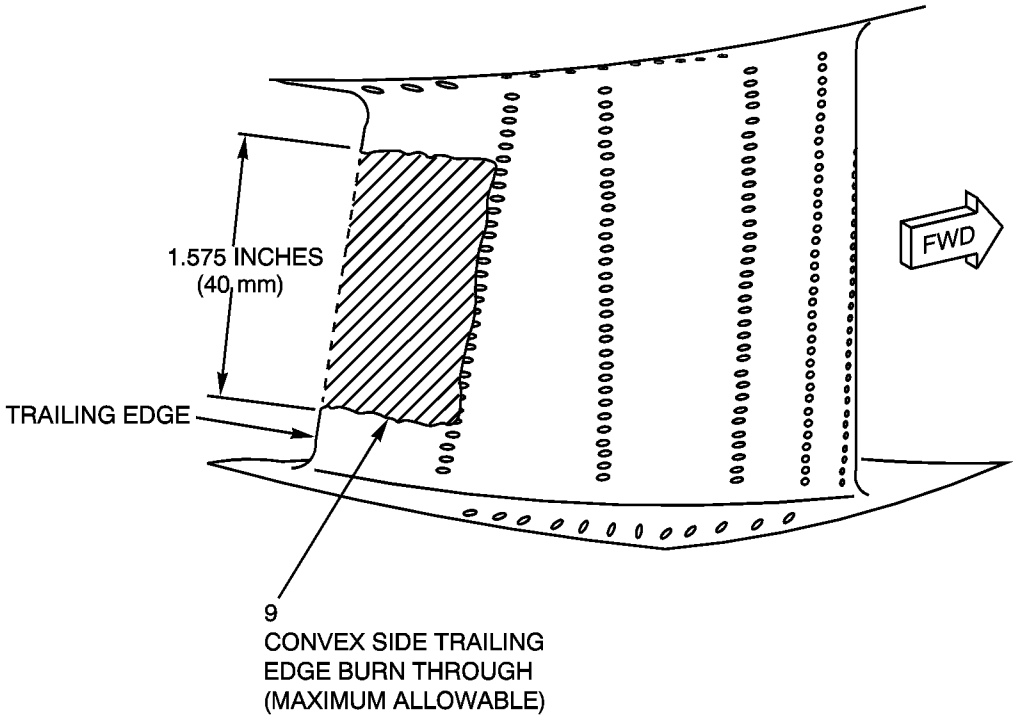


REGULAR INTERVAL INSPECTION
CONVEX SIDE

BM5 72 00 00 6 KJPE 00

L-D3528 (0907)
PW V

Convex Side Trailing Edge Regular
Inspection Interval (Regular Inspection) (Sheet 5/6)
Figure 646

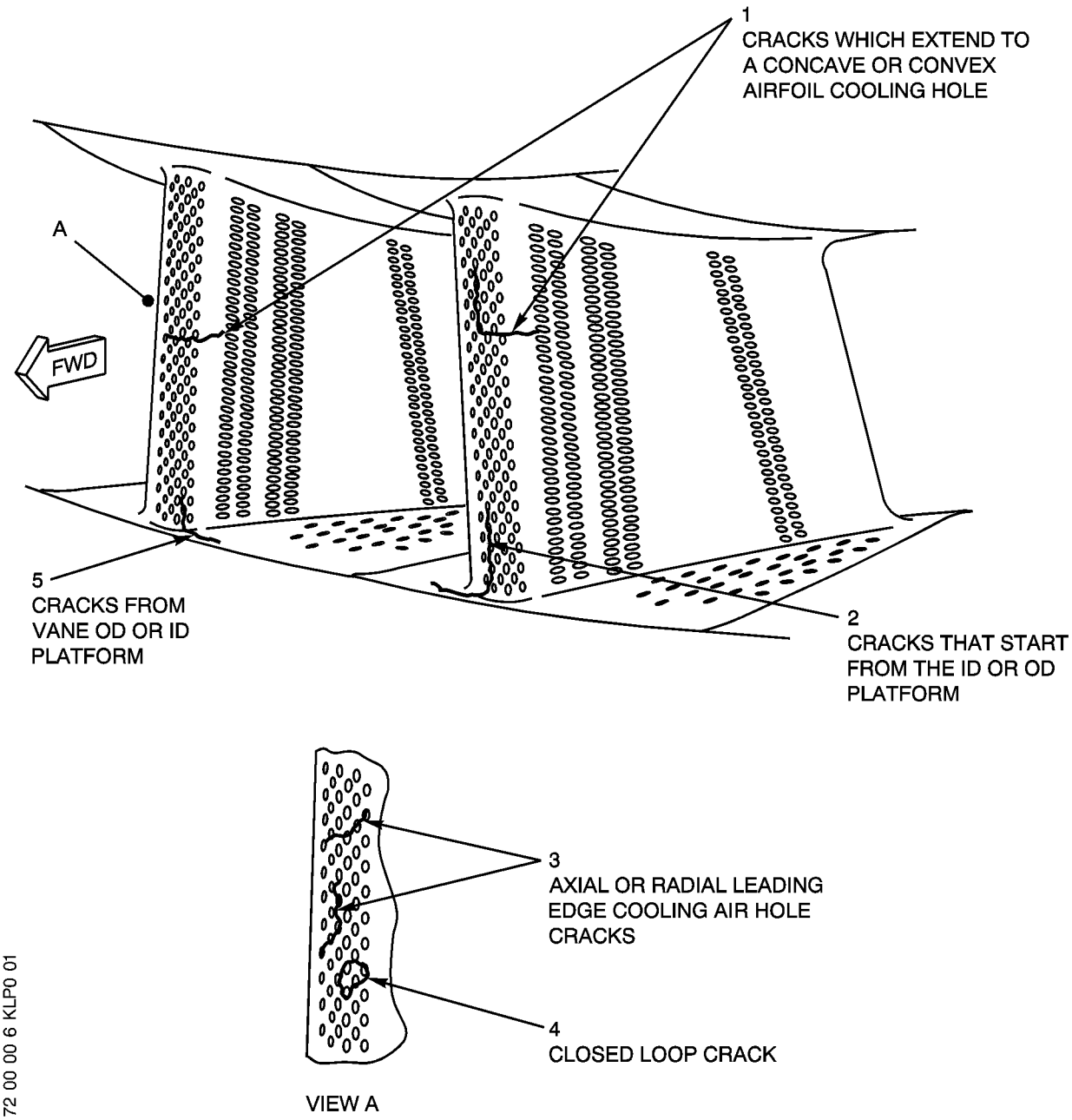


150 CYCLE
REDUCED INTERVAL INSPECTION
CONVEX SIDE

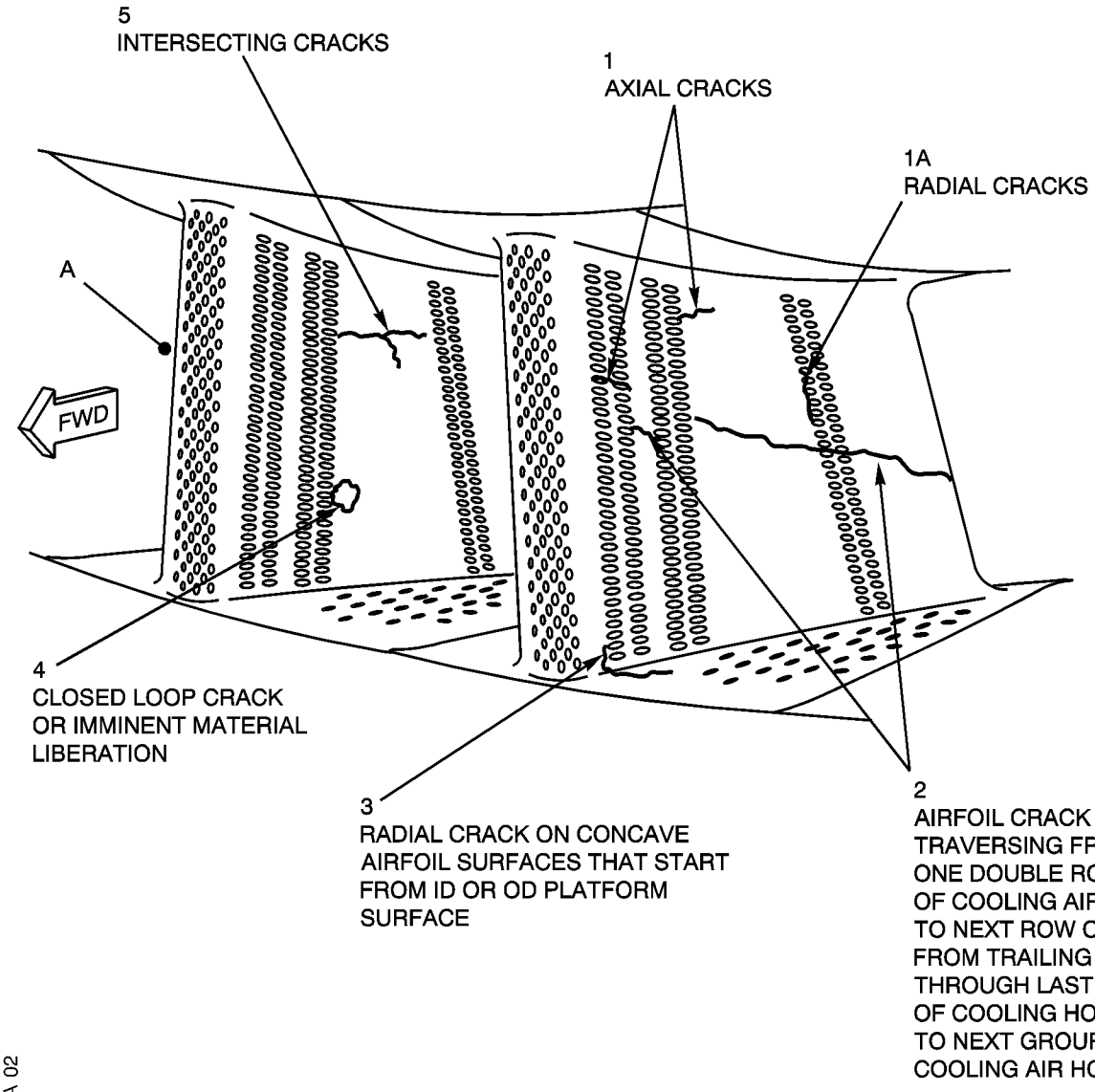
BM5 72 00 00 6 KJPF 00

L-D3529 (0907)
PW V

Convex Side Trailing Edge Inspection
(150 Cycle) (Sheet 6/6)
Figure 646



Stage 1 HPT Vane Observed Damage - Leading Edge Cracks
Figure 647

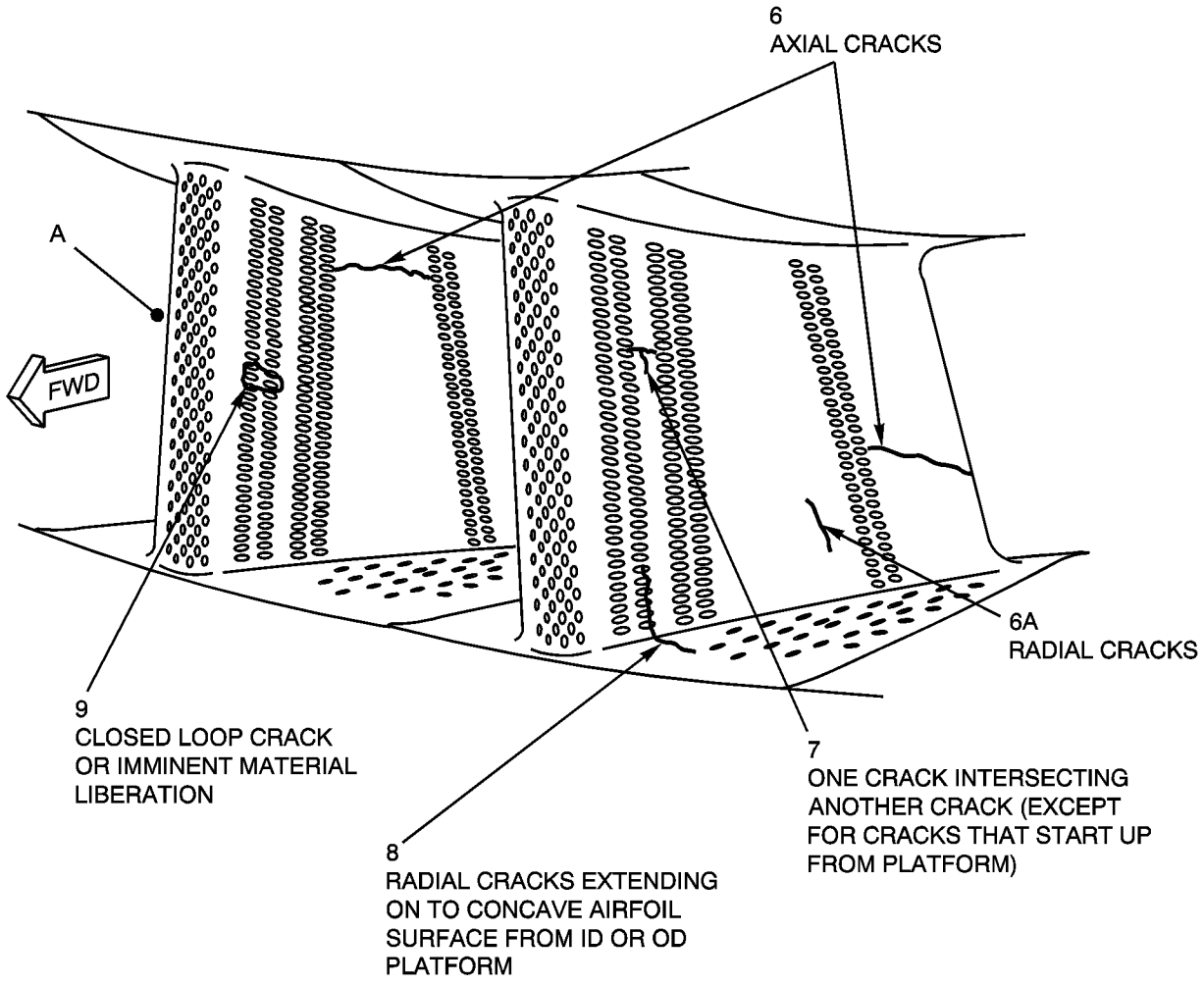


REGULAR INSPECTION INTERVAL

BM5 72 00 00 6 KDZA 02

L-A1740 (0907)
PW V

Stage 1 HPT Vane Observed Damage - Airfoil Cracks on Concave Side (Sheet 1/2)
Figure 648

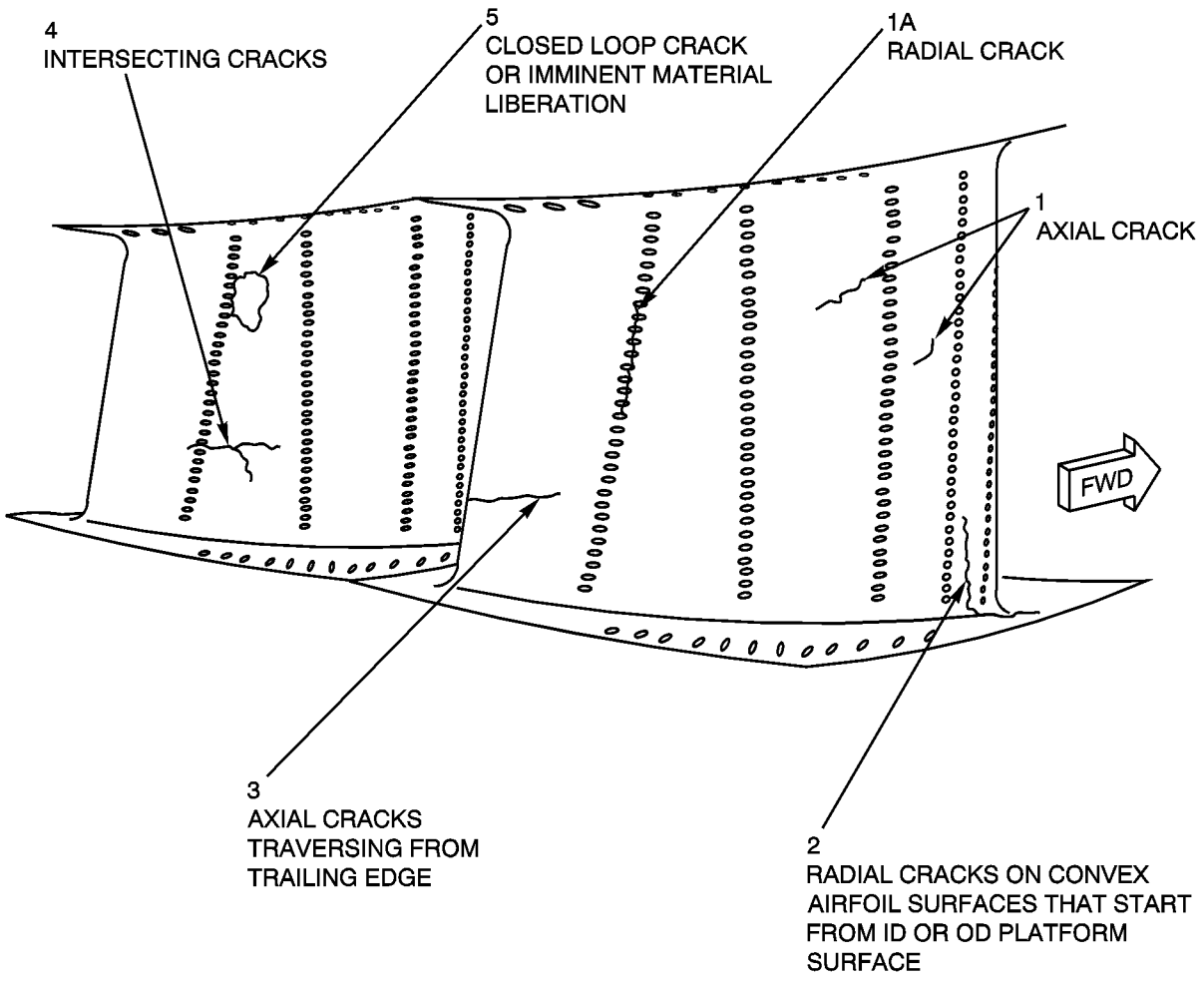


BM5 72 00 00 6 KDZB 02

300 CYCLE
REDUCED INSPECTION INTERVAL

L-A1743 (0907)
PW V

Stage 1 HPT Vane Observed Damage - Airfoil Cracks on Concave Side (Sheet 2/2)
Figure 648

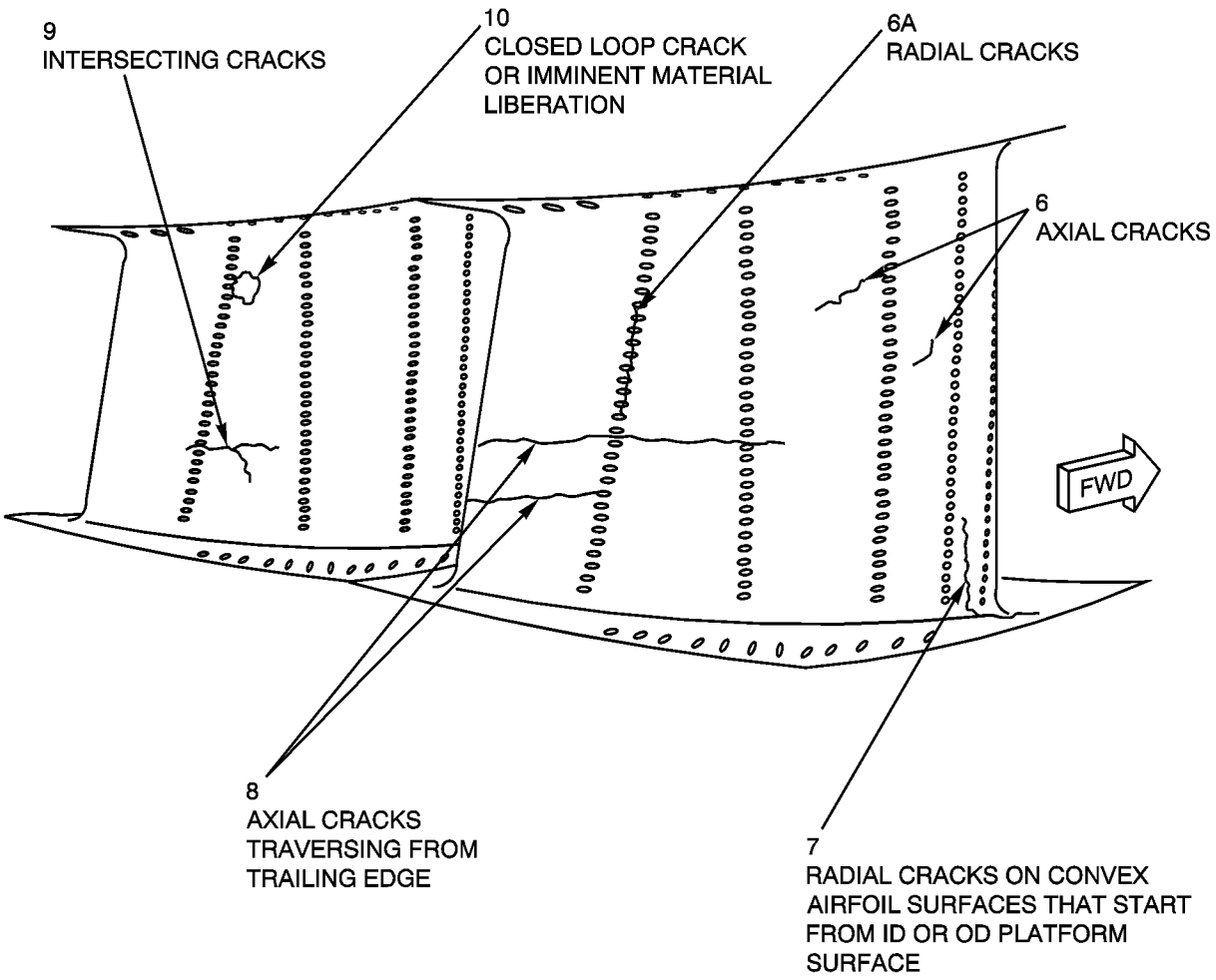


REGULAR INSPECTION INTERVAL

BM5 72 00 00 6 KEZA 03

L-A1744 (0907)
PW V

Stage 1 HPT Vane Observed Damage - Airfoil Cracks on Convex Side (Sheet 1/2)
Figure 649

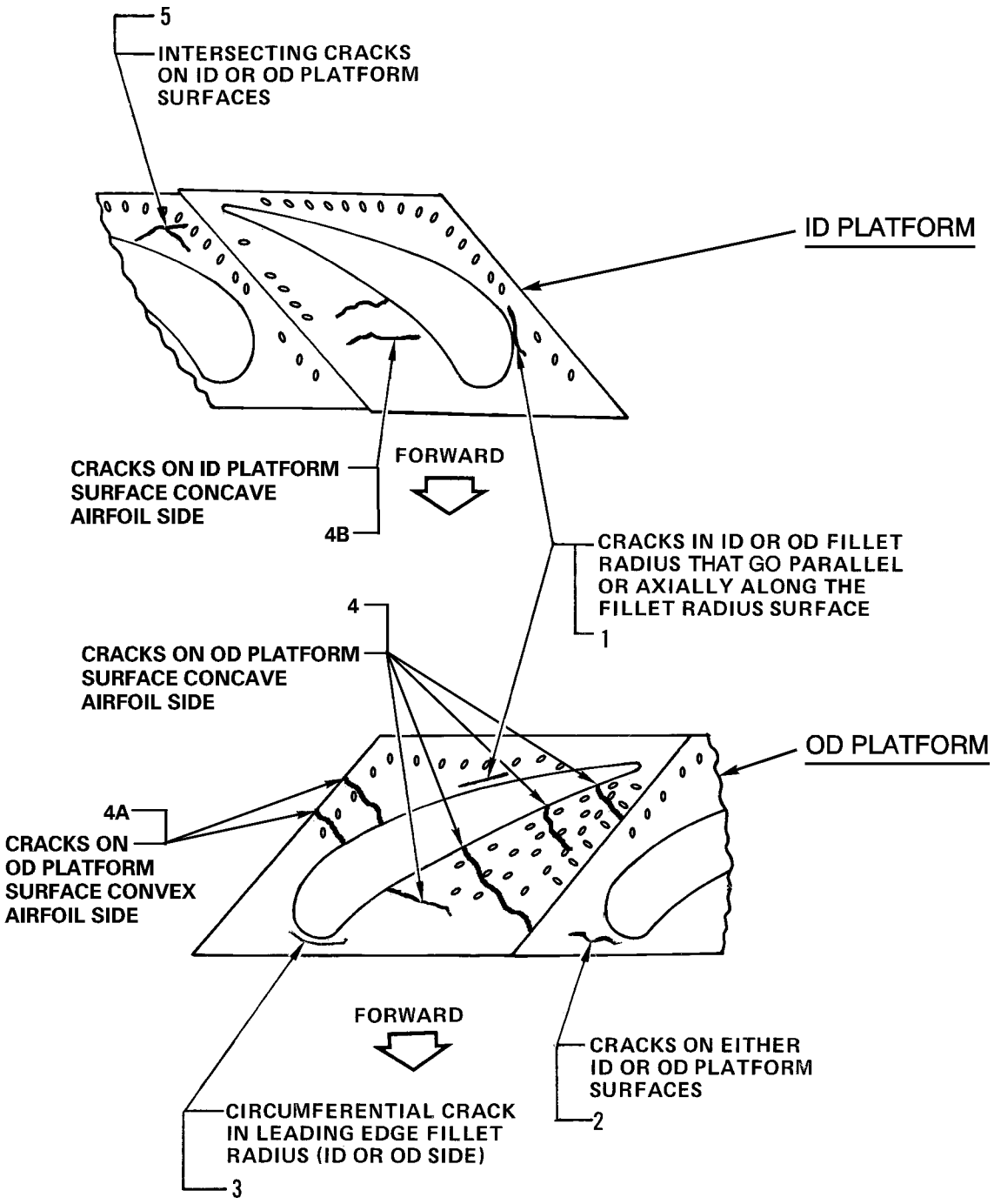


300 CYCLE
REDUCED INSPECTION INTERVAL

BM5 72 00 00 6 KEZB 02

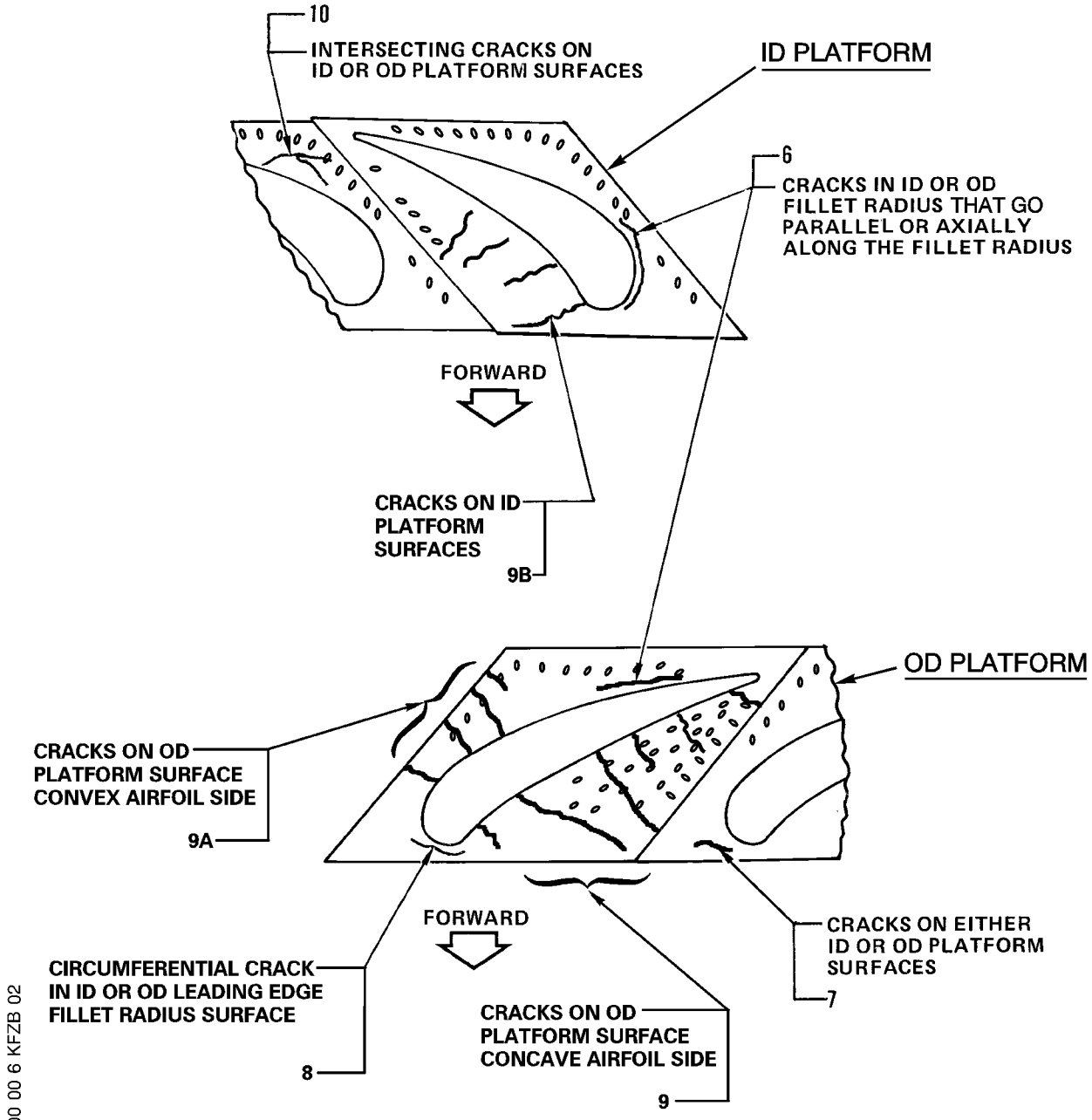
L-A1745 (0907)
PW V

Stage 1 HPT Vane Observed Damage - Airfoil Cracks on Convex Side (Sheet 2/2)
Figure 649


5
INTERSECTING CRACKS ON ID OR OD PLATFORM SURFACES
ID PLATFORM
CRACKS ON ID PLATFORM SURFACE CONCAVE AIRFOIL SIDE
4B
FORWARD
CRACKS IN ID OR OD FILLET RADIUS THAT GO PARALLEL OR AXIALLY ALONG THE FILLET RADIUS SURFACE
1
4
CRACKS ON OD PLATFORM SURFACE CONCAVE AIRFOIL SIDE
OD PLATFORM
4A
CRACKS ON OD PLATFORM SURFACE CONVEX AIRFOIL SIDE
FORWARD
CRACKS ON EITHER ID OR OD PLATFORM SURFACES
2
CIRCUMFERENTIAL CRACK IN LEADING EDGE FILLET RADIUS (ID OR OD SIDE)
3
REGULAR INSPECTION INTERVAL
L-A1746 (0907)
PW C

BM5 72 00 00 6 KFZA 02

Stage 1 HPT Vane Observed Damage - ID, OD Platform (Buttress) Cracks (Sheet 1/2)
Figure 650


10
INTERSECTING CRACKS ON ID OR OD PLATFORM SURFACES
ID PLATFORM
6
CRACKS IN ID OR OD FILLET RADIUS THAT GO PARALLEL OR AXIALLY ALONG THE FILLET RADIUS
FORWARD
CRACKS ON ID PLATFORM SURFACES
9B
OD PLATFORM
CRACKS ON OD PLATFORM SURFACE CONVEX AIRFOIL SIDE
9A
FORWARD
CRACKS ON EITHER ID OR OD PLATFORM SURFACES
7
CIRCUMFERENTIAL CRACK IN ID OR OD LEADING EDGE FILLET RADIUS SURFACE
8
CRACKS ON OD PLATFORM SURFACE CONCAVE AIRFOIL SIDE
9
BM5 72 00 00 6 KFZB 02

300 CYCLE
REDUCED INSPECTION INTERVAL

L-A1747 (0907)
PW C

Stage 1 HPT Vane Observed Damage - ID, OD Platform
(Buttress) Cracks (Sheet 2/2)
Figure 650

6. Perform Borescope Inspection of Stage 1 HPT Blades and Duct Segments (AP-9/AP-11/AP-8)

A. Equipment and Materials

ITEM	DESIGNATION
(1)PWA86411	Guide Tube, AP-8 Port (use with a flexible borescope)
(2)	Circuit Breaker Safety Clips
(3)	Torque Wrench
(4)	Washer (AP-9)
(5)	Gasket (AP-11)
(6)	Corrosion Resistant Steel Lockwire (AS3214-02) (Ref. 70-00-00) (AP-9)
(7)Material No.P03-001	Oils (Ref. 70-00-00).
(8)Material No.P06-023	Lubricants (Ref. 70-00-00)
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure (Ref. Fig. 651, 652, 653) (Ref. Fig. 654)
(1)Remove plug and washer from borescope access port number A-9, located on the rear of the diffuser case at the 3 o'clock location. See Table 601 for additional AP-9 borescope access port data.
(a)Make an inspection of the AP-9 plug. Measure the shaft diameter for wear. If the shaft diameter minimum dimension is less than 0.100 in. (2.540 mm), the AP-9 plug must be replaced.
(2)For engines equipped, remove three bolts, plug, and gasket from borescope access port AP-11 located on the lower turbine cooling air tube elbow at the 7 o'clock position.
(3)To inspect stage 1 blades through AP-8 port, refer to paragraph 4. and remove plug and gasket from the AP-8 access port(s).
(a)Put PWA86411 guide tube through the diffuser case access port at the AP-8 location with the tip pointed toward the front of the engine. Turn and position the tube such that the flexible borescope, when installed, will point rearward towards the first stage nozzle guide vanes. Lock the guide tube in position by use of the compression nut.

CAUTION : TEMPERATURES IN AREAS TO BE BORESCOPED SHOULD BE PERMITTED TO COOL BELOW 150°F (65.6°C) FOLLOWING ENGINE OPERATION.
DAMAGE MAY RESULT TO BORESCOPE EQUIPMENT IF EQUIPMENT IS EXPOSED TO GASPATH OR METAL TEMPERATURES IN EXCESS OF 150°F (65,6°C).
AS A GUIDE, IF ADJACENT CASES ARE TO HOT TO TOUCH COMFORTABLY, BORESCOPE INSPECTION SHOULD BE DELAYED.

(4)Insert borescope through port and inspect stage 1 blades for nicks, dents, cracks, tip damage, erosion, coating loss, liberated material, bent tips, tip rub, airfoil growth, blocked cooling holes, airfoild bulging and burning, sulfidation and damage caused by passage of foreign material (Ref. Fig. 658). To view each blade, rotate high rotor using hand or foot operated equipment per paragraph 1. C. instructions.

NOTE : Conditions noted above are per blade and unless otherwise stated all blades may exhibit conditions described within limits provided.

NOTE : Maximum borescope insertion depth and borescope limiting access hole diameter specifications for AP-9, AP-11, AP-8 are provided in Table 601 (Sheet 3).

(5)Borescope inspection limits for Stage 1 HPT blades

NOTE : Additional borescope recommendations for certain part number (configuration) high pressure turbine 1st stage blades are contained in SB PW4ENG 72-422. The information in SB PW4ENG 72-422 must be combined with the information that follows to form a complete inspection program for high pressure turbine 1st stage blades (applicable only to engines with 1st stage blades addressed by SB PW4ENG 72-422).

CAUTION : FOLLOWING LIMITS ARE APPLICABLE ON A CONTINUE-IN-SERVICE BASIS ONLY. LIMIT IS BASED ON PART STRUCTURAL REQUIREMENTS AND DOES NOT IMPLY THAT ENGINE PERFORMANCE, STABILITY, OPERATING LIMITS, OR PART REPARABILITY WILL BE MAINTAINED.

(a)Limits for blade conditions observed during borescope inspection are given in (Ref. Fig. 653, 655, 654).

(b)Airfoil bulging

1 Inspect for concave side bulging. Using a flexible borescope through AP-11 it is possible to detect a bulge by keeping the borescope parallel and very close to the concave airfoil surface. Small bulges may be detectable by a shadow seen beyond the bulge (Ref. Fig. 654) (Sheet 1/2).
Using a flexible borescope through AP-8 with a guide tube or through AP-9 it may also be possible to detect larger bulges.

2 For engines not equipped with AP-11, or as an alternate method, inspect for concave side airfoil dark spots using a flexible borescope with a guide tube through AP-8. A flexible or rigid scope through AP-9 may also be used for this inspection. First stage HPT blades which have bulged airfoils typically exhibit a large dark spot in the region of the bulge. Dark spots extending forward of the fifth tip cooling hole are indicative of hot operating conditions, for the blade, which may result in bulging (Ref. Fig. 654) (Sheet 2/2) for dark spot and fifth tip cooling hole identification.

CAUTION : LOSS OF BLADE COATING MAY RESULT IN DEGRADATION OF THE BASE ALLOY. THIS CONDITION, AS WELL AS HOT CORROSION ATTACK (SULFIDATION), CAN AFFECT BLADE REPARABILITY.

(c)Blade erosion/corrosion

NOTE : First indication of corrosion is circular shaped stains or markings on blade outer surfaces. Characteristic of sulfidation corrosive attack is a greenish to pale blue color.

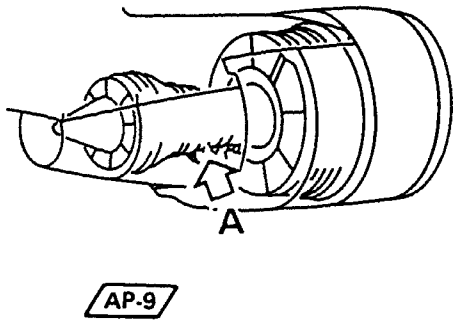
(6)Examine the HPT 1st stage duct segments for spalling (ceramic coating which is not there).
(a)All quantities of spalling are permitted.
(b)Ceramic spalling causes the conditions that follow :
1 Increased tip clearance of the HPT 1st stage blade.
2 Increased EGT.
3 Increased fuel consumption.
4 Possible damage to the tip of the HPT 1st stage blades.
5 Possible damage to the HPT 2nd stage blades.
(7)If the HPT 1st stage duct segments are spalled, do the inspection of the HPT 1st and 2nd stage blades for damage.
(8)After borescope inspection, reinstall AP-9 plug and new washer and for engines equipped, install AP-11 plug, new gasket and three bolts per requirements of Table 606.
CAUTION : MAKE CERTAIN THAT BORESCOPE PLUGS ARE CORRECTLY INSTALLED. A MISSING PLUG CAN CAUSE IMPORTANT DAMAGE TO COMPONENTS AND/OR NACELLE STRUCTURE.

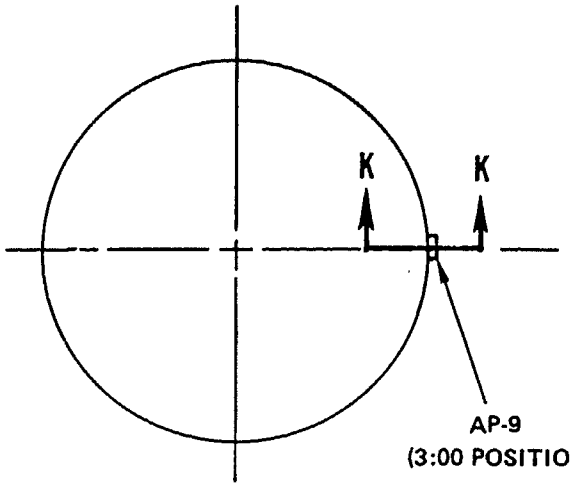
AP-11, AP-9 Borescope Plug Installation Data
Table 606

AP Number and Location	Washer/Gasket Required	Plug Locking Method	Bolt Replacement Lubricant	Bolt (2) Torque lbf. in. (m.daN)
AP-9 Rear of Diffuser Case	YES PN584977 (Washer)	Lockwire (AS3214-02)	P06-023 Lubricants (Ref. 70-00-00)	40-50 (0.45-0.56)
AP-11 Lower TCA Tube	YES PNST1142-011 (Gasket)	Self locking	P03-001 Oils (Ref. 70-00-00)	75-85 (0.85-0.96)

(9)Reinstall AP8 plugs,
CAUTION : MAKE CERTAIN THAT BORESCOPE PLUGS ARE CORRECTLY INSTALLED. A MISSING PLUG CAN CAUSE IMPORTANT DAMAGE TO COMPONENTS AND/OR NACELLE STRUCTURE.
(a)Remove PWA86441 Guide Tube from AP-8 port. Refer to paragraph 4. and install the AP-8 plugs and gaskets per the installation data in Table 604.

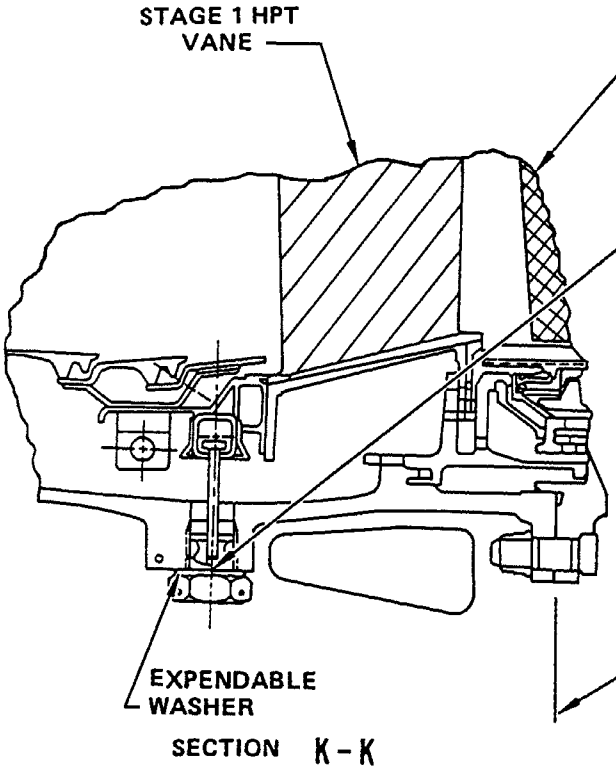
D. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close fan and thrust reverser cowl doors. Remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).





REAR VIEW
SCHEMATIC

A



SECTION K - K

AP 9
BORESCOPE ACCESS PORT

- SEE TABLE 601 FOR AP-9 DATA
- REMOVE PLUG AP-9 AND WASHER FROM DIFFUSER CASE TO VIEW FRONT OF STAGE 1 HPT VANE AND STAGE 1 HPT BLADE.
- AFTER BORESCOPE INSPECTION REINSTALL PLUG AND NEW WASHER IN ACCORDANCE WITH REQUIREMENTS OF INSTALLATION TABLE.

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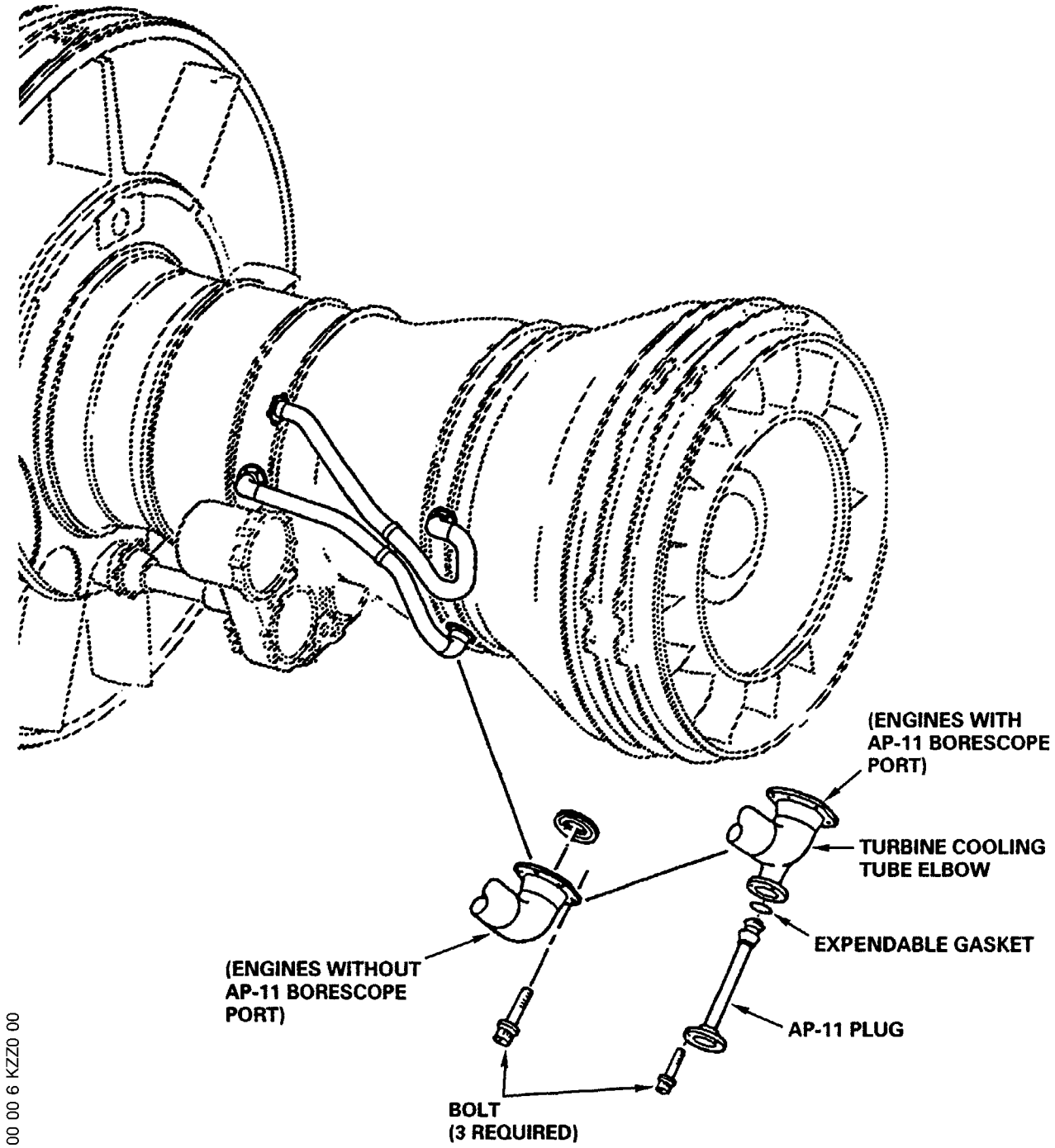
Stage 1 HPT Blade Borescope Access Port (AP-9) Location
Figure 651



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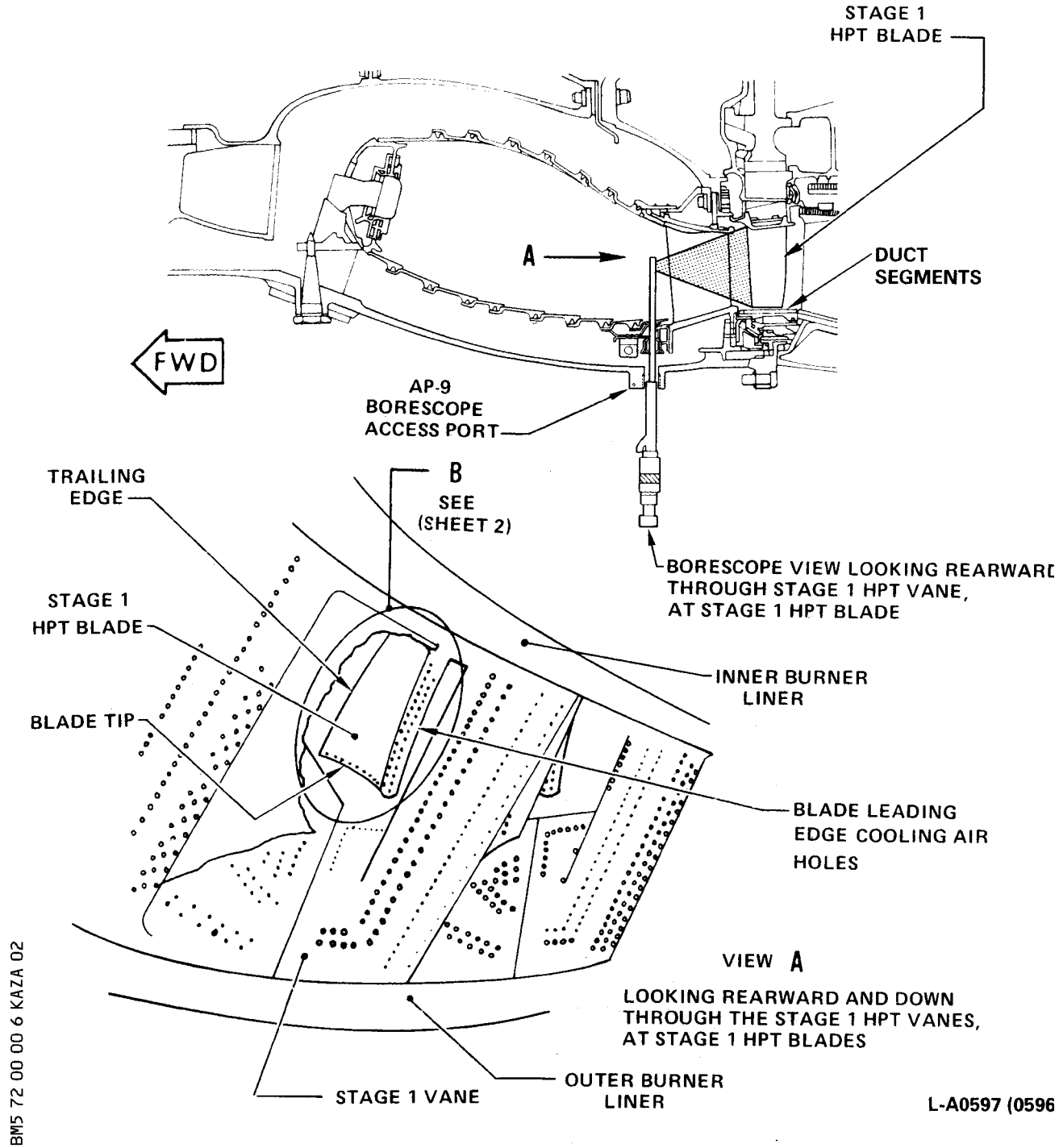
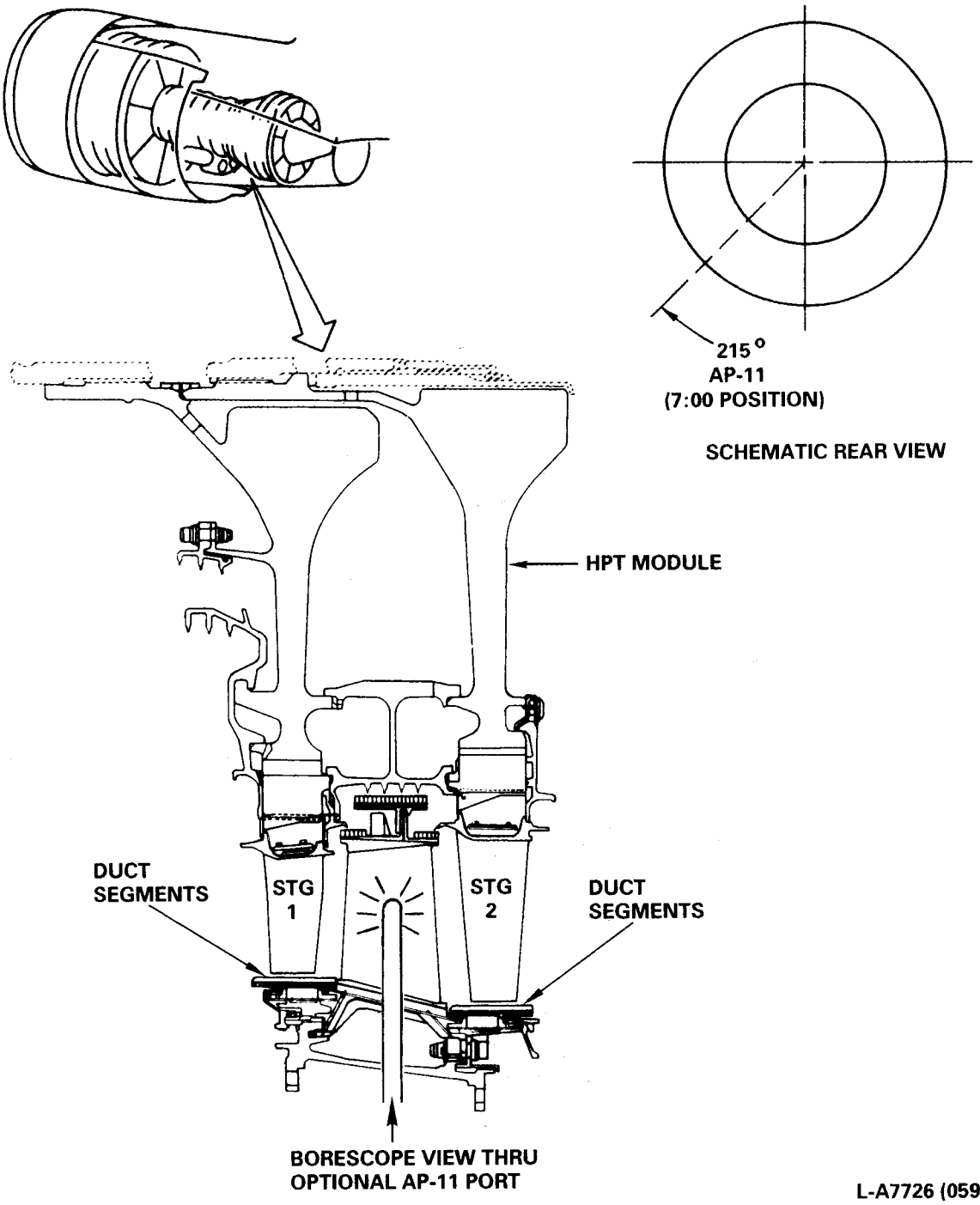
Stage 1 HPT Blade Borescope Access Port (AP-11) Location
Figure 652



Borescope Viewing of Stage 1 HPT Blades (AP-9)
(Sheet 1/3)
Figure 653



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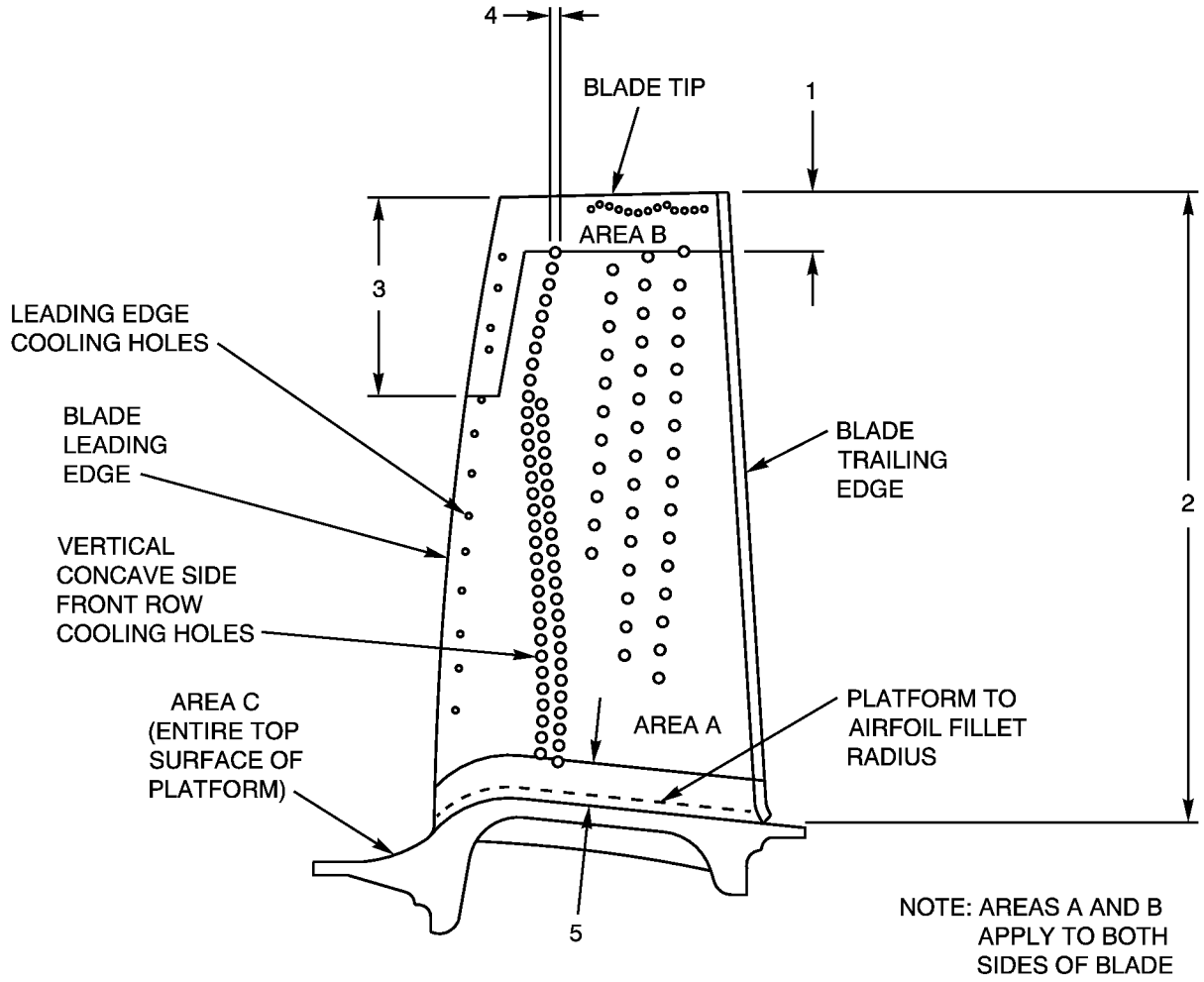
Borescope Viewing of Stage 1 HPT Blades (AP-11)
(Sheet 2/3)
Figure 653



VIEW B (ROTATED)

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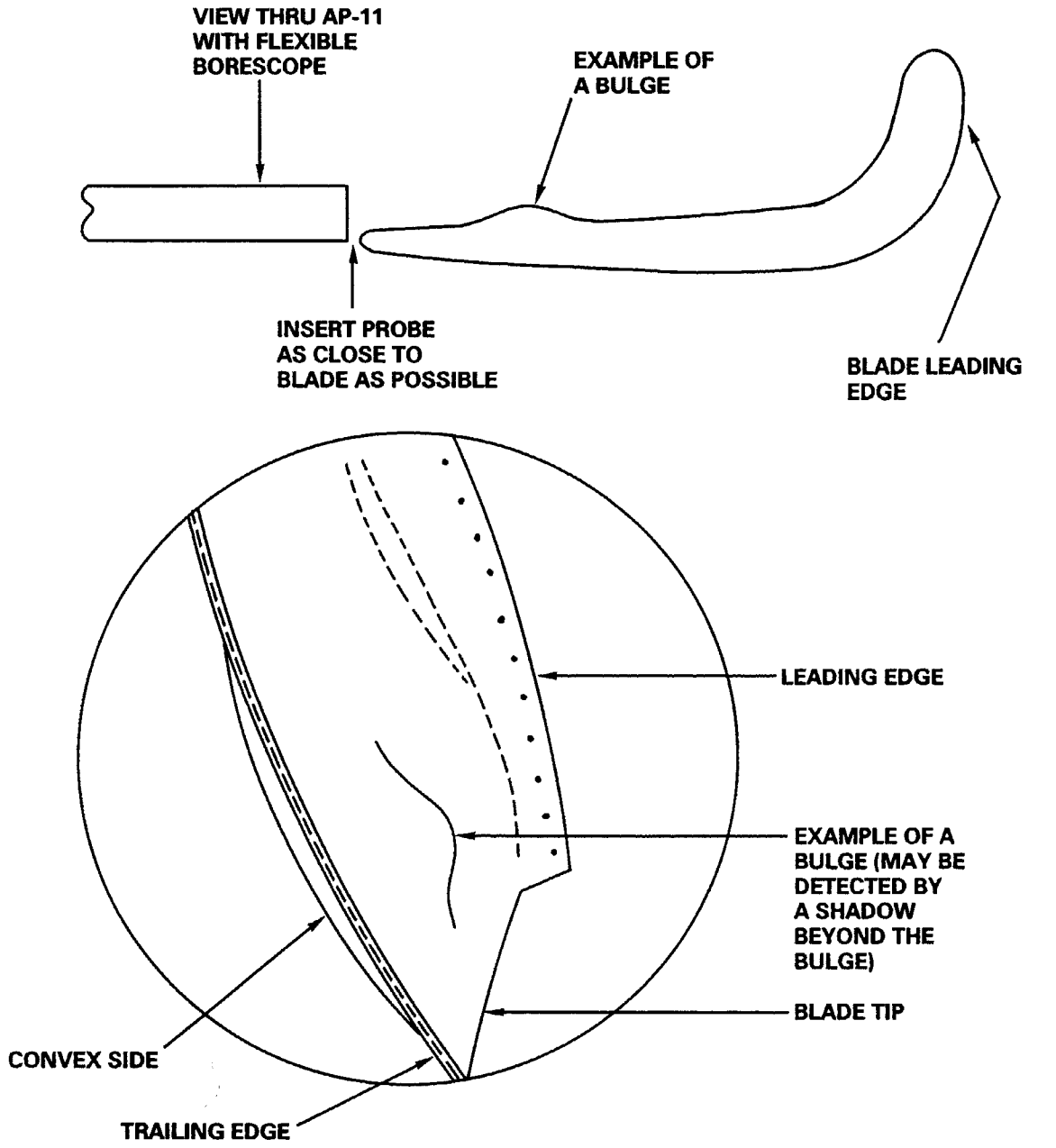
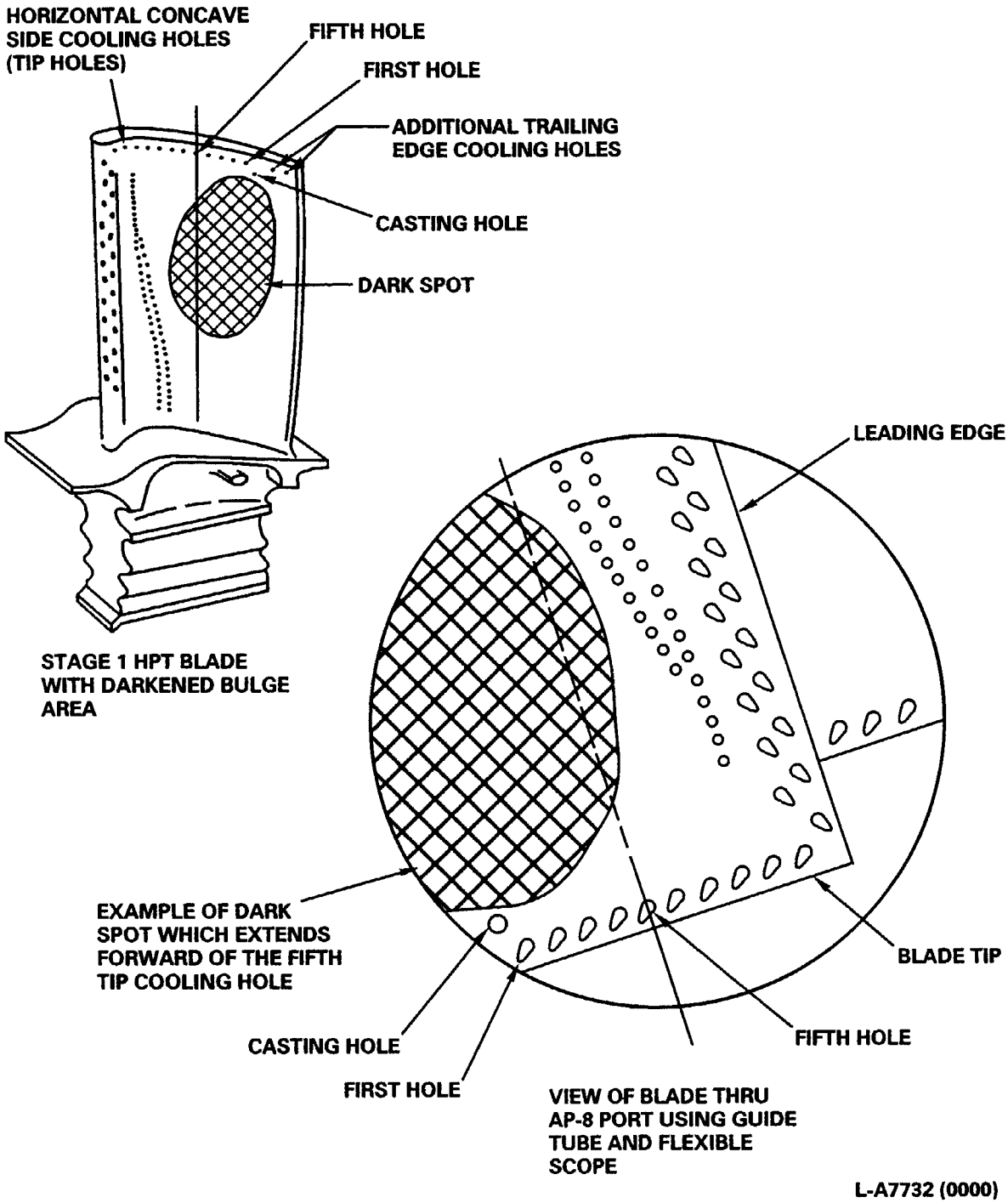
BM5 72 00 00 6 KAZP 02

1. 0.250 IN. (6.35 MM)
2. 2.8 IN. (71.12 MM)
3. 1.0 IN. (25.40 MM)
4. 0.100 IN. (2.54 MM) FORWARD OF THE VERTICAL CONCAVE SIDE FRONT ROW COOLING HOLES
5. 0.250 IN. (6.35 MM) ABOVE PLATFORM, REFERENCE

Stage 1 HPT Blade Inspection Areas (Sheet 3/3)
R Figure 653



Borescope Inspection of Stage 1 HPT Blades Through
AP-11 Port Using Flexible Probe (Sheet 1/2)
Figure 654


HORIZONTAL CONCAVE SIDE COOLING HOLES (TIP HOLES)
FIFTH HOLE
FIRST HOLE
ADDITIONAL TRAILING EDGE COOLING HOLES
CASTING HOLE
DARK SPOT
STAGE 1 HPT BLADE WITH DARKENED BULGE AREA
LEADING EDGE
EXAMPLE OF DARK SPOT WHICH EXTENDS FORWARD OF THE FIFTH TIP COOLING HOLE
BLADE TIP
CASTING HOLE
FIFTH HOLE
FIRST HOLE
VIEW OF BLADE THRU AP-8 PORT USING GUIDE TUBE AND FLEXIBLE SCOPE
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Borescope Inspection of Stage 1 HPT Blades Through
AP-8 Port Using Flexible Probe (Sheet 2/2)
Figure 654

OBSERVED CONDITION	BLADE INSPECT -ION AREA	MAXIMUM DAMAGE FOR REGULAR INTERVAL INSPECTION	MAXIMUM DAMAGE FOR REDUCED INTERVAL INSPECTION	REMOVE ENGINE WITHIN 5 CYCLES OR IMMEDIATE ENGINE REMOVAL
Nicks And Dents	A	Not Permitted	One Nick Or Dent Per Blade To .080 Inch (2.032 mm) In Length Or Diameter Is Permitted.	Exceedance Of Reduced Interval Inspection Limit
Note: No Crack Associated With A Nick Or dent Is Permitted Except As Noted in "Axial or Radial Cracks" Observed Condition	B	Any Amount Of Nicks Or Dents To .080 Inch (2.032 mm) In Length Or Diameter Is Permitted.	Any Amount Of Nicks Or Dents To .125 Inch (3.175 mm) In Length Or Diameter Is Permitted.	Immediate Engine Removal Required For Imminent Part Failure OR Imminent Material Liberation
Burning NOTE: Burning That Causes A Decrease In Cooling Air Flow Is Not Permitted	A, B and C	Burning Not Permitted	Burned Areas To .750 Inch (19.050mm) Diameter Or .442 Square Inch (285. Square mm). Leading Edge Burned Area To .400 Inch (10.160 mm) Diameter Or .126 Square Inch (81.0 Square mm).	
Spalled Or Eroded Coating	A, B and C	Any Amount Permitted	Any Amount Permitted	

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L-A9424 (0000)

Stage 1 HPT Blade Borescope Inspection Limits
(Sheet 1/3)
Figure 655

OBSERVED CONDITION	BLADE INSPECTION AREA	MAXIMUM DAMAGE FOR REGULAR INTERVAL INSPECTION	MAXIMUM DAMAGE FOR REDUCED INTERVAL INSPECTION	REMOVE ENGINE WITHIN 5 CYCLES OR IMMEDIATE ENGINE REMOVAL
AXIAL OR RADIAL CRACKS NOTES: 1) SEE "MATERIAL BREAK-THROUGH TO INTERNAL CAVITY" FOR OPEN AREA DEFINITION 2) MATERIAL TEARS TO BE TREATED AS A CRACK.	A	NOT PERMITTED	ONE HOLE TO HOLE CRACK ON THE LEADING EDGE ONLY. NO AIRFOIL CRACKS.	EXCEEDANCE OF REDUCED INSPECTION LIMIT. IMMEDIATE ENGINE REMOVAL FOR IMMINENT PART FAILURE OR IMMINENT MATERIAL LIBERATION.
	B	AXIAL OR RADIAL CRACKS OR HOLE TO HOLE CRACKS AT TIP OR LEADING EDGE PERMITTED. NO BREAKTHROUGH OR OPEN AREAS. NO INTERSECTING CRACKS OR IMMINENT MATERIAL LIBERATION.	AXIAL OR RADIAL CRACKS ON THE LEADING EDGE, AIRFOIL OR TIP AREA ARE PERMITTED. BREAKTHROUGH TO INTERNAL CAVITY WITH OPEN AREA TO BREAKTHROUGH LIMIT IS PERMITTED.	
	C	ANY NUMBER OF PLATFORM EDGE CRACKS ARE PERMITTED. PLATFORM CURL (BEND) IS NOT PERMITTED.	ANY NUMBER OF PLATFORM EDGE CRACKS EXTEND INTO THE PLATFORM TO THE AIRFOIL FILLET RADIUS ARE PERMITTED. CRACKS THAT EXTEND RADIALLY INTO THE AIRFOIL UP TO 0.250 INCH (6.35 mm) ABOVE THE PLATFORM. PLATFORM CURL (BEND) IS NOT PERMITTED.	ANY NUMBER OF PLATFORM EDGE CRACKS THAT GO MORE THAN 0.250 INCH (6.350 mm) RADIALLY PAST THE PLATFORM INTO THE AIRFOIL. ANY CRACKS IN THE RADIUS THAT GO IN A CHORDWISE DIRECTION. PLATFORM CURL (BEND) IS NOT PERMITTED.
MATERIAL BREAK-THROUGH OR BURN-THROUGH INTO INTERNAL CAVITY	A	NOT PERMITTED	NOT PERMITTED	NOT PERMITTED REQUIRES ENGINE REMOVAL.
	B	NOT PERMITTED	ONE DEFECT PER BLADE CONSISTING OF PARTIAL TIP LOSS OR OPEN AREA TO .125 SQUARE INCH (81 sq mm) OPENING, INTO THE INTERNAL CAVITY. MAXIMUM OF FIVE BLADES PER ROTOR.	IF THE OPEN AREA IS MORE THAN THE REDUCED INTERVAL INSPECTION LIMIT BUT WITHIN AREA B, REMOVE THE ENGINE WITHIN 50 CYCLES. IF THE OPEN AREA IS MORE THAN AREA B, (OUSIDE OF) REMOVE THE ENGINE WITHIN 5 CYCLES OR IMMEDIATELY.
BENT TIP	B	PERMITTED IF OTHER CONDITIONS ARE NOT EXCEEDED.		

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PW V

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Stage 1 HPT Blade Borescope Inspection Limits
(Sheet 2/3)
Figure 655

R

OBSERVED CONDITION	BLADE INSPECT -ION AREA	MAXIMUM DAMAGE FOR REGULAR INTERVAL INSPECTION	MAXIMUM DAMAGE FOR REDUCED INTERVAL INSPECTION	REMOVE ENGINE WITHIN 5 CYCLES OR IMMEDIATE ENGINE REMOVAL
Leading Edge Holes And Trailing Edge Cooling Air Slot Blockage	A And B	Maximum Of Two Non-Adjacent Leading Edge Holes And A Maximum Of Two Trailing Edge Slots Can Be Blocked.		Exceedance Of Limit.
Blocked Tip Cooling Air Holes.	B	A Maximum Of Two Holes Blocked.	Any Amount Provided That Tip Distress Is Within Other Observed Condition Limits.	
Tip Rub Or Plasma Spray Loss	B	Any Amount Is Acceptable If Not Rubbed Into The Internal Cavity.		Exceedance Of Limit.
Liberated Blade Parent Material	A and B	Not Permitted	Not Permitted Except As Defined For "Material Breakthrough Into Internal Cavity". Observed Condition	
Airfoil Growth	A and B	Not Permitted	Not Permitted	Not Permitted Requires Immediate Engine Removal
Airfoil Bulging (Refer To Text)	REFER TO TEXT	Bulging Is Not Permitted	Bulging Is Not Permitted	Not Permitted Remove Engine Within 25 Cycles (this replaces the 5 cycle limit.)

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BM5 72 00 00 6 KMZS 04

Stage 1 HPT Blade Borescope Inspection Limits
(Sheet 3/3)
Figure 655

7. Perform Borescope Inspection of Stage 2 HPT Blades and Duct Segments (AP-10, AP-11)

A. Equipment and Materials

NOTE : See paragraph 1. B. for borescope equipment.

NOTE : See paragraph 1. C. for high rotor rotating equipment.

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
(2)	Torque Wrench
(3)	Gasket
(4)	Corrosion Resistant Steel Lockwire (MS9226-04) (Ref. 70-00-00)
(5)PWA86081	Puller (AP-10 Plug Assembly)
(6)Material No.P03-001	Oils (Ref. 70-00-00)
(7)Material No.P06-023	Lubricants (Ref. 70-00-00)
(8)Material No.P11-027	Cleaning Agents (Ref. 70-00-00)
Referenced Procedure	
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up

(1)Open, safety and tag appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure (Ref. Fig. 656, 657, 652)

(1)Remove lockwire and two bolts from borescope access port AP-10 located on LPT case at 4:30 o'clock position. Using PWA86081 puller, remove, as an assembly, the boss plug, plug stop (cover), spring washer, and the cotter pin. Discard the boss plug gasket.

(2)For engines equipped, remove three bolts, plug, and gasket from the AP-11 borescope access port located on the turbine cooling air tube elbow at the 7 o'clock position Ref. Table 601 for additional AP-10/AP-11 access port data.

CAUTION : TEMPERATURES IN AREAS TO BE BORESCOPED SHOULD BE PERMITTED TO COOL BELOW 150°F (65.6°C) FOLLOWING ENGINE OPERATION. DAMAGE MAY RESULT TO BORESCOPE EQUIPMENT IF EQUIPMENT IS EXPOSED TO GASPATH OR METAL TEMPERATURES IN EXCESS OF 150°F (65.6°C). AS A GUIDE, IF ADJACENT CASES ARE TO HOT TO TOUCH COMFORTABLY, BORESCOPE INSPECTION SHOULD BE DELAYED.

(3)Insert borescope through port and inspect stage 2 blades for nicks, dents, cracks, tip damage, erosion, coating loss, liberated material, bent tips, tip rub, airfoil growth, blocked cooling holes, sulfidation and damage caused by passage of foreign material (Ref. Fig. 658). To view each blade, rotate high rotor using hand or foot operated equipment per paragraph 1. C. instructions.

NOTE : Conditions noted above are per blade and unless otherwise stated all blades may exhibit conditions described within limits provided.

NOTE : Maximum borescope insertion depth and borescope limiting access hole diameter specifications for AP-10 and AP-11 are provided in

Table 601 (Sheet 3).

(4)Borescope inspection limits for Stage 2 blades

CAUTION : FOLLOWING LIMITS ARE APPLICABLE ON A CONTINUE-IN-SERVICE BASIS ONLY. LIMIT IS BASED ON PART STRUCTURAL REQUIREMENTS AND DOES NOT IMPLY THAT ENGINE PERFORMANCE, STABILITY, OPERATING LIMITS, OR PART REPARABILITY WILL BE MAINTAINED.

(a)Limits for blade conditions observed during borescope inspection are given in (Ref. Fig. 657, 658).

NOTE 1 : (Ref. Fig. 657)(Sheet 4) for airfoil growth observation.

(b)Blade cracking. The limits for blade cracking observed during borescope inspection are given in (Ref. Fig. 657, 658).

CAUTION : LOSS OF BLADE COATING MAY RESULT IN DEGRADATION OF THE BASE ALLOY. THIS CONDITION, AS WELL AS HOT CORROSION ATTACK (SULFIDATION), CAN AFFECT BLADE REPARABILITY.

(c)Blade erosion/corrosion

NOTE : First indication of corrosion is circular shaped stains or markings on blade outer surfaces. Characteristics of sulfidation corrosive attack is a greenish to pale blue color.

(5)Examine the HPT 2nd stage duct segments for spalling (ceramic coating which is not there).

(a)All quantities of spalling are permitted.

(b)Ceramic spalling causes the conditions that follow :

1 Increased tip clearance of the HPT 2nd stage blade.

2 Increased EGT.

3 Increased fuel consumption.

4 Possible damage to the tip of the HPT 2nd stage blades.

(6)If the HPT 2nd stage duct segments are spalled, do the inspection of the HPT 1st and 2nd stage blades for damage.

(7)After borescope inspection, reinstall as an assembly, the AP-10 plug, spring tension washer, plug stop, cotter pin and a new gasket. Install gasket into boss with split facing inward. See Table 607 before installing this assembly.

CAUTION : MAKE CERTAIN THAT BORESCOPE PLUGS ARE CORRECTLY INSTALLED. A MISSING PLUG CAN CAUSE IMPORTANT DAMAGE TO COMPONENTS AND/OR NACELLE STRUCTURE.

NOTE : If plug, washer and plug stop (cover) have been disassembled, reassemble and install per step (8) procedure.

AP-11, AP-10 Borescope Plug Installation Data
Table 607

AP Number and Location	Gasket Required	Bolt (2) Locking Method	Bolt (2) Replacement Lubricant	Bolt (2) Torque lbf. in. (m.daN)
AP-10 Stage 2 HPT Blades	Yes ST1146-08	Lockwire (MS9226-04)	P06-023 Lubricants (Ref. 70-00-00)	54-60 (0.61-0.68)
AP-11	Yes	Self Locking	P03-001	75-85

AP Number and Location	Gasket Required	Bolt (2) Locking Method	Bolt (2) Replacement Lubricant	Bolt (2) Torque lbf. in. (m.daN)
Lower TCA Tube	PNST1142-011		Oils (Ref. 70-00-00)	(0.85-0.96)

(8)If required, assemble AP-10 borescope plug, spring tension washer, plug stop (cover) and cotter pin as follows :

NOTE : When plug, spring tension washer and cover are properly assembled and installed to turbine case, plug should be loaded inward, by spring washer, to seat in case boss.

(a)Place washer into cover recess so that washer OD contacts cover and concave surface of washer is towards cover recess.

(b)Insert plug into cover washer from washer side.

(c)Install cotter pin into hole in plug, with cotter pin head seated firmly on flat side of plug. Bend cotter pin prongs so that head and prongs are firmly seated against plug.

(d)Install new gasket, split facing inward, into borescope boss on turbine case.

(9)Secure plug stop to AP-10 boss.

(a)Thoroughly clean bolt threads and AP-10 boss threads with Material No.P11-027 to remove carbon deposits and any deposits of previously applied Material No.P03-006.

(b)Treat threads of 2 bolts with Material No. P06.023. Remove excess material.

(c)Secure plug to AP-10 borescope boss on case with 2 bolts (above). TORQUE and wirelock bolts per Table 607.

(10)Reinstall AP-11 plug.

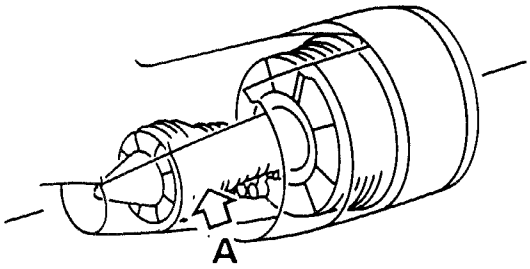
CAUTION : MAKE CERTAIN THAT BORESCOPE PLUGS ARE CORRECTLY INSTALLED. A MISSING PLUG CAN CAUSE IMPORTANT DAMAGE TO COMPONENTS AND/OR NACELLE STRUCTURE.

(a)For engine equipped, install AP-11 plug and a new gasket per the requirements of table 607.

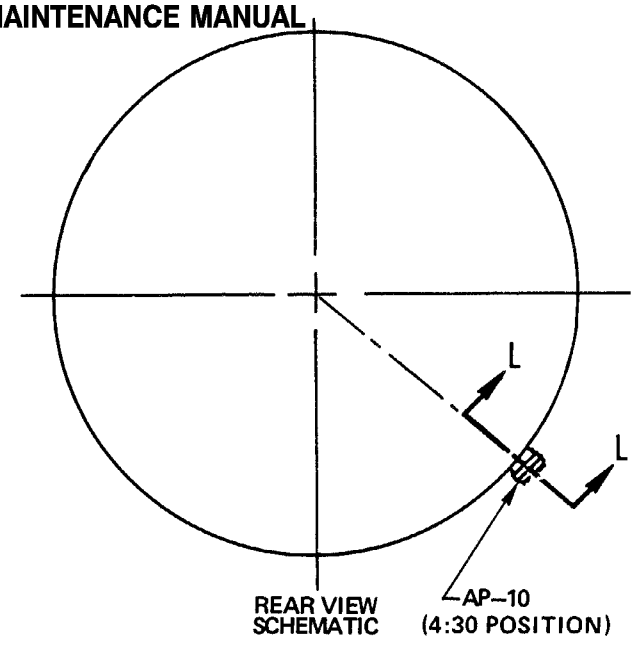
D. Close-Up

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

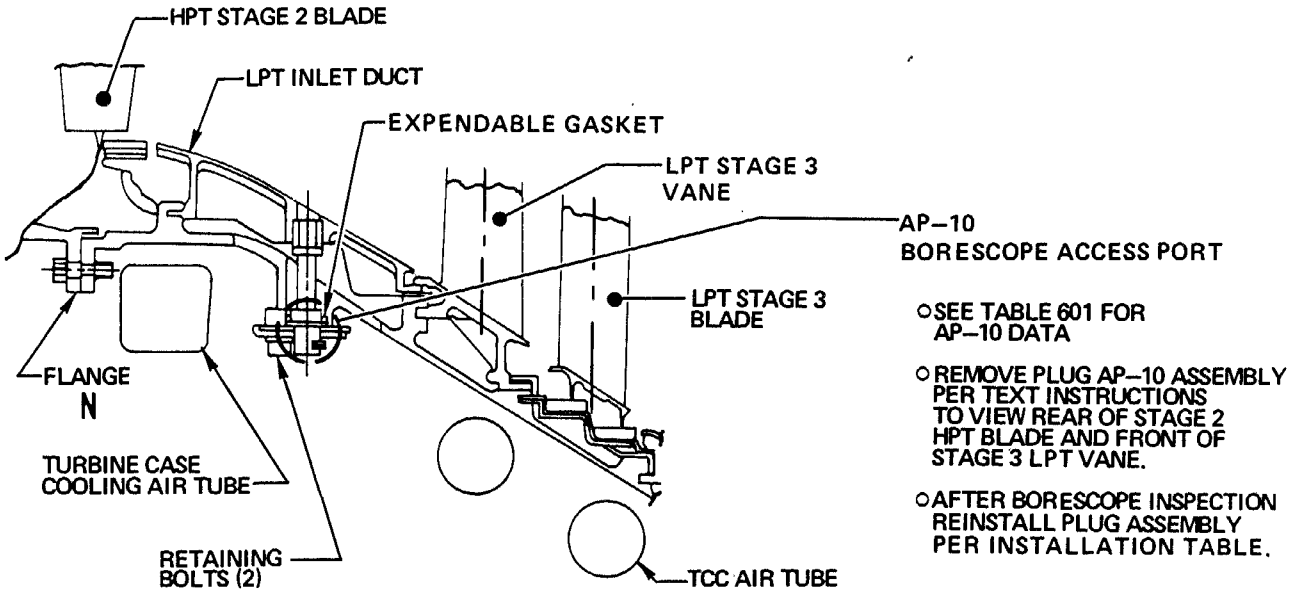
(2)Close fan and thrust reverser cowl doors. Remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



AP–10



A



- SEE TABLE 601 FOR AP–10 DATA
- REMOVE PLUG AP–10 ASSEMBLY PER TEXT INSTRUCTIONS TO VIEW REAR OF STAGE 2 HPT BLADE AND FRONT OF STAGE 3 LPT VANE.
- AFTER BORESCOPE INSPECTION REINSTALL PLUG ASSEMBLY PER INSTALLATION TABLE.

SECTION L–L
(ROTATED)

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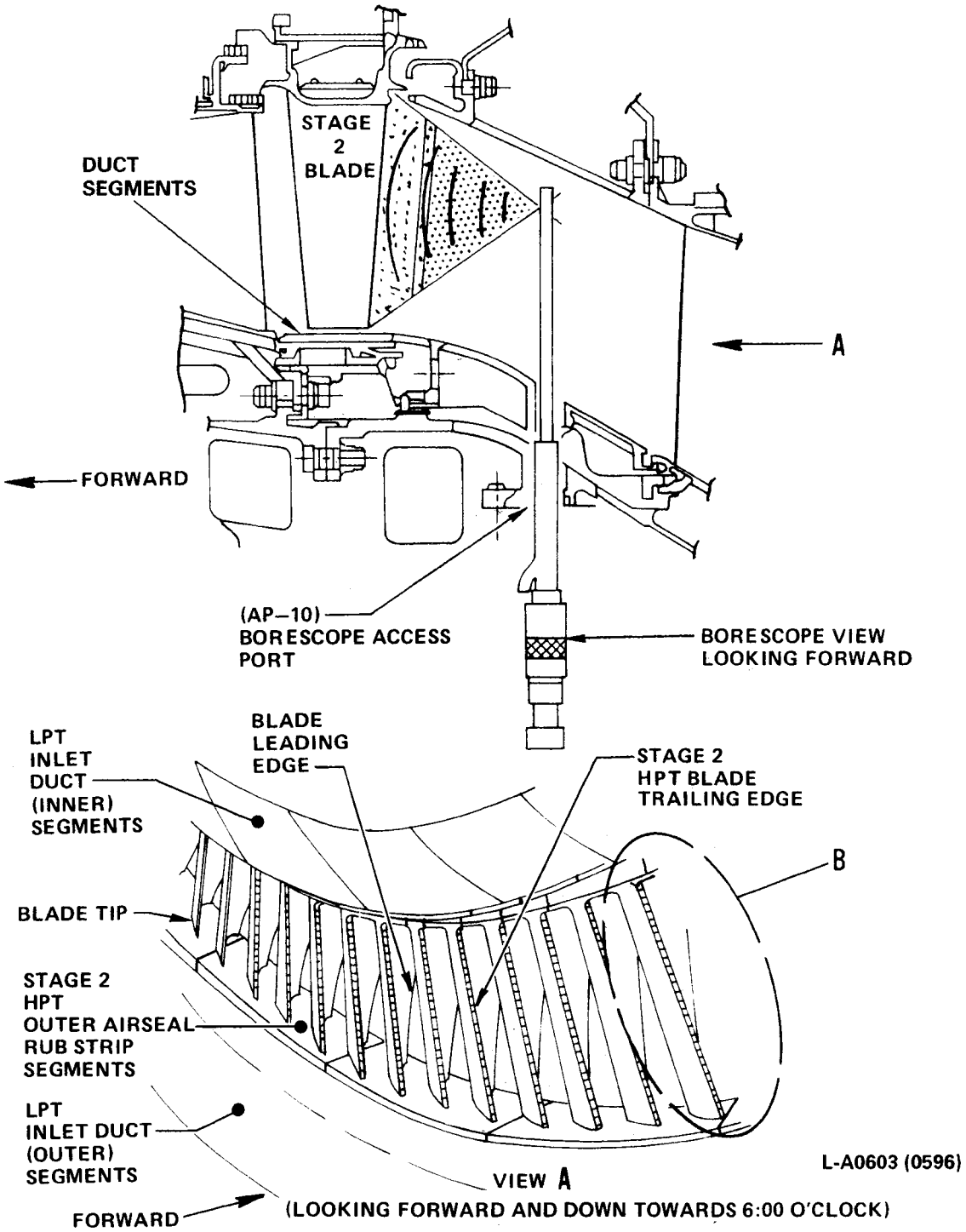
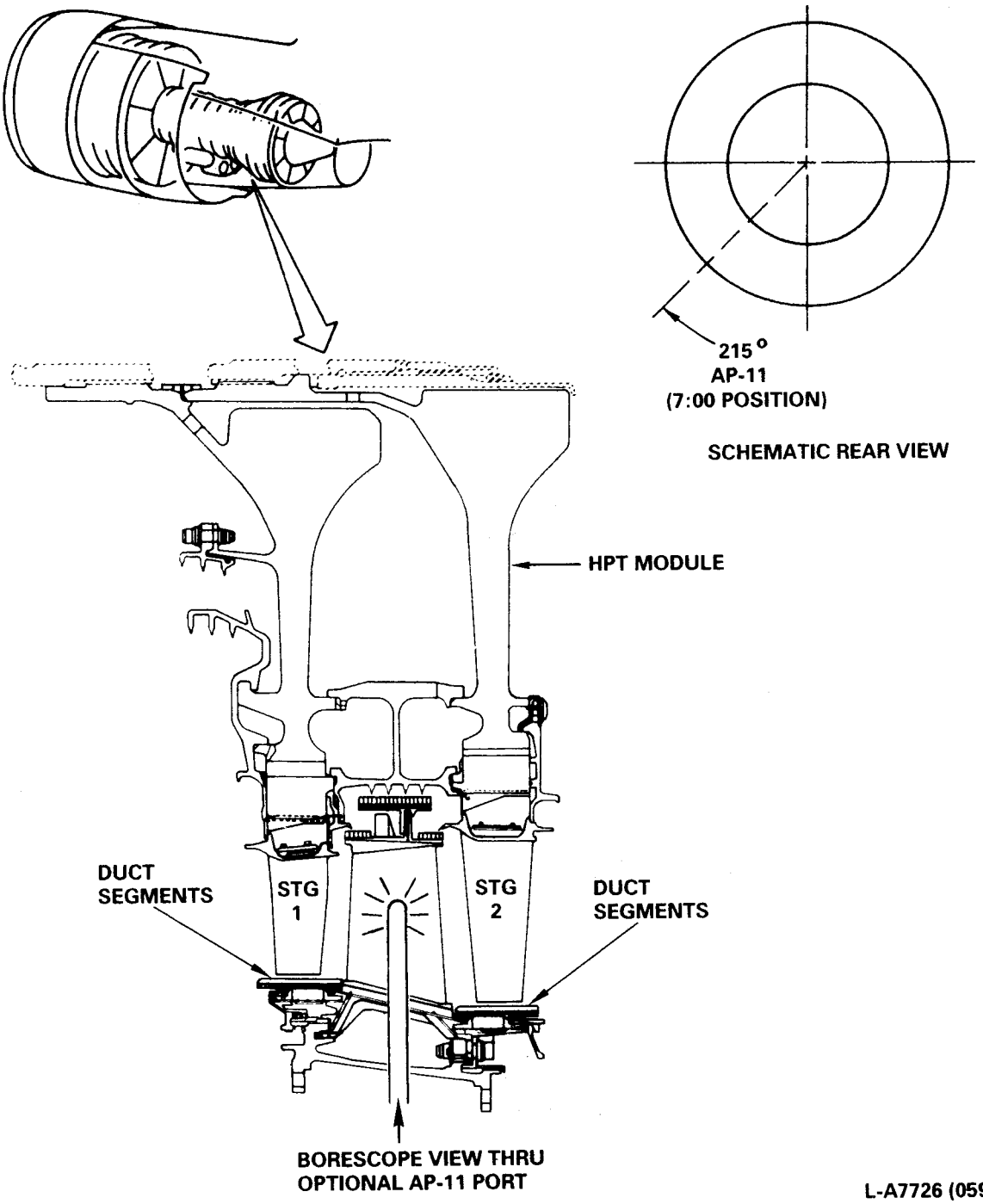
Stage 2 HPT Blade Borescope Access Port (AP-10) Location
Figure 656



Borescope Viewing of Stage 2 HPT Blades (AP-10)
(Sheet 1)
Figure 657



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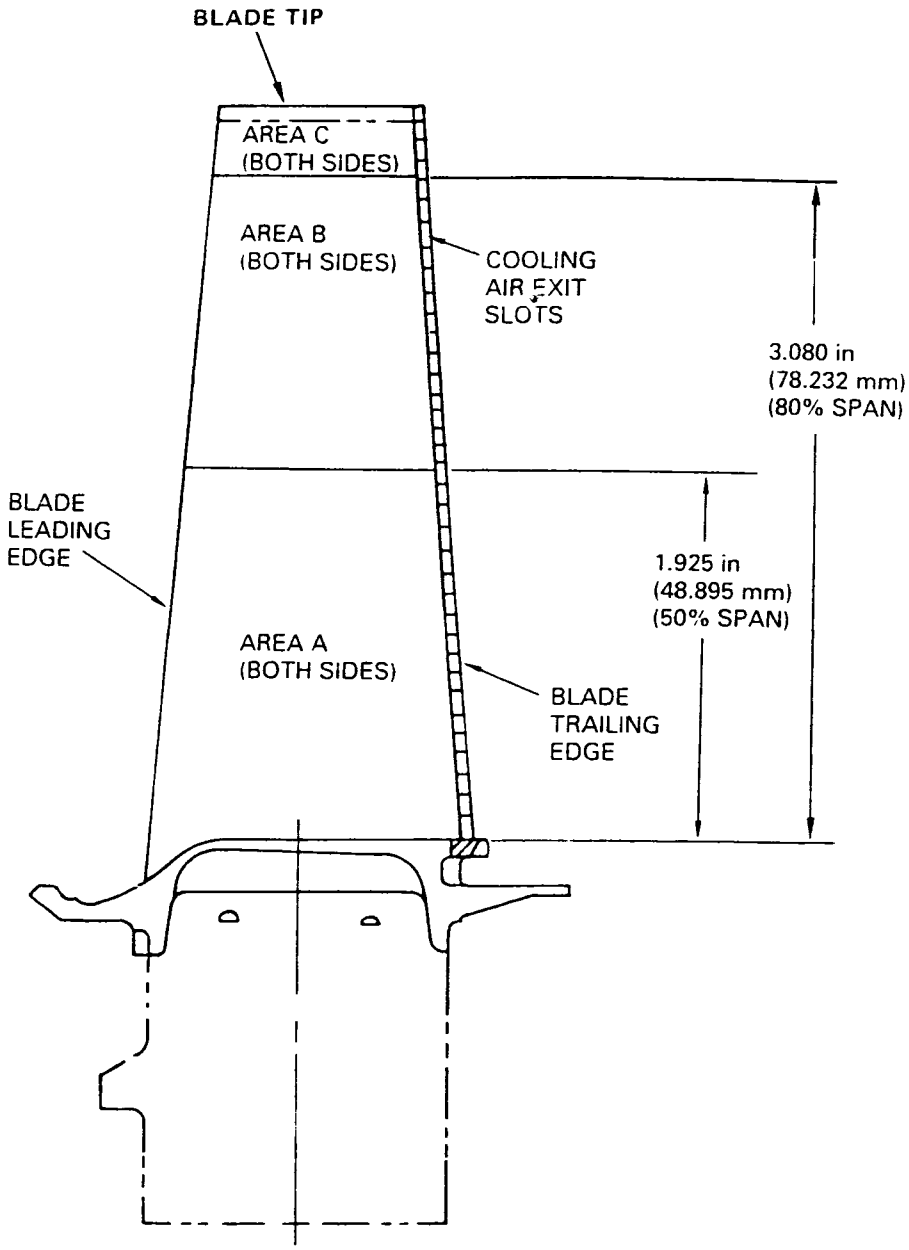
Borescope Viewing of Stage 2 HPT Blades (AP-11)
(Sheet 2)
Figure 657



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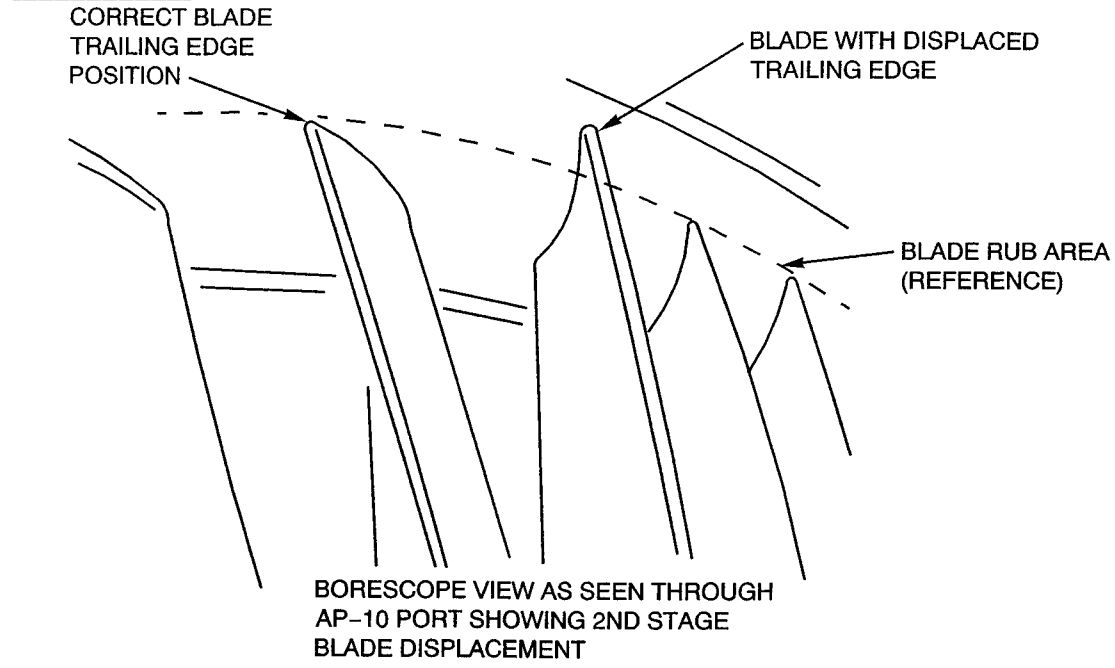
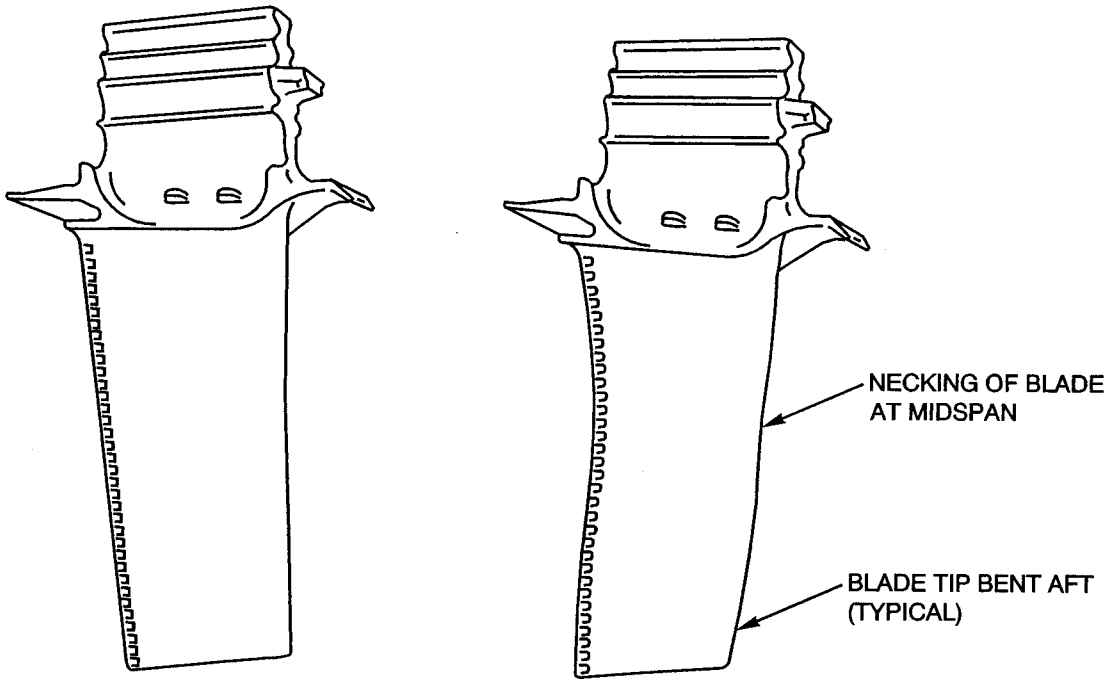
Stage 2 HPT Blade Inspection Areas (Sheet 3)
Figure 657


CORRECT BLADE TRAILING EDGE POSITION
BLADE WITH DISPLACED TRAILING EDGE
BLADE RUB AREA (REFERENCE)
BORESCOPE VIEW AS SEEN THROUGH AP-10 PORT SHOWING 2ND STAGE BLADE DISPLACEMENT



BM5 72 00 00 6 KBZE 00

Borescope View Showing a Typical Displaced Stage 2 Blade Caused by Airfoil Growth (Sheet 4)
Figure 657

OBSERVED CONDITION	BLADE INSPEC-TION AREA	MAXIMUM DAMAGE FOR REGULAR INTERVAL INSPECTION	MAXIMUM DAMAGE FOR REDUCED INTERVAL INSPECTION	IF THE LIMIT IS EXCEEDED, REMOVE ENGINE WITHIN 5 CYCLES OR AS NOTED BELOW
NICKS AND DENTS NOTE: NO CRACK ASSOCIA-TED WITH A NICK OR DENT IS PERMITTED EXCEPT AS NOTED IN "AXIAL OR RADIAL CRACKS" OBSERVED CONDITION	A	NOT PERMITTED	ONE NICK OR DENT PER BLADE TO .025 inch (0.635 mm) IN LENGTH OR DIAMETER IS PERMITTED	FOR IMMINENT MATERIAL LIBERATION, REMOVE ENGINE IMMEDIATELY
	B	ANY NUMBER OF NICKS OR DENTS TO .130 inch (3.302 mm) IN LENGTH OR DIAMETER IS PERMITTED	ANY NUMBER OF NICKS OR DENTS TO .250 inch (6.350 mm) IN LENGTH OR DIAMETER IS PERMITTED	
	C	ANY NUMBER OF NICKS OR DENTS TO .130 inch (3.302 mm) IN LENGTH OR DIAMETER IS PERMITTED	ANY NUMBER OF NICKS OR DENTS TO .300 inch (7.620 mm) IN LENGTH OR DIAMETER IS PERMITTED	
LOSS OF COATING, BURNING OR EROSION	A	ONE DEFECT PER BLADE CONSISTING OF ANY AMOUNT OF COATING LOSS OR BURNED AREA ON THE AIRFOIL TO .750 inch (19.050 mm) IN DIAMETER OR .442 square inch (285. square mm). LEADING EDGE BURNED AREA TO .400 inch (10.160 mm) DIAMETER OR .126 square inch (81 square mm).		
	B	SAME AS "A" ABOVE	SAME AS "A" ABOVE	
	C	SAME AS "A" ABOVE	ONE DEFECT PER BLADE CONSISTING OF ANY AMOUNT OF COATING LOSS OR BURNING. MATERIAL LOSS TO THE BREAKTHROUGH LIMIT IS PERMITTED.	

BM5 72 00 00 6 KGZA 02

L-B1923 (0000)

Stage 2 HPT Blade Borescope Inspection Limits (Sheet 1)
Figure 658

OBSERVED CONDITION	BLADE INSPECTION AREA	MAXIMUM DAMAGE FOR REGULAR INTERVAL INSPECTION	MAXIMUM DAMAGE FOR REDUCED INTERVAL INSPECTION	IF THE LIMIT IS EXCEEDED, REMOVE ENGINE WITHIN 5 CYCLES OR AS NOTED BELOW
AXIAL OR RADIAL CRACKS NOTES: 1) SEE "MATERIAL BREAK THROUGH TO INTERNAL CAVITY" FOR OPEN AREA DEFINITION. 2) MATERIAL TEARS TO BE TREATED AS A CRACK.	A	NOT PERMITTED	NOT PERMITTED	REMOVE ENGINE IMMEDIATELY
	B	NOT PERMITTED	AXIAL OR RADIAL CRACKS UP TO .130 inch (3.302 mm) ARE PERMITTED PROVIDED THAT THERE ARE NO OPEN AREAS. INTERSECTING CRACKS OR IMMINENT MATERIAL LIBERATION ARE NOT PERMITTED.	FOR IMMINENT MATERIAL LIBERATION, REMOVE ENGINE IMMEDIATELY
	C	AXIAL OR RADIAL CRACKS ARE PERMITTED PROVIDED THAT THERE ARE NO OPEN AREAS. NO INTERSECTING CRACKS OR IMMINENT MATERIAL LIBERATION ARE PERMITTED.	AXIAL OR RADIAL CRACKS ON THE LEADING EDGE OR AIRFOIL AT TIP ARE PERMITTED. BREAK-THROUGH TO INTERNAL CAVITY WITH OPEN AREA TO BREAKTHROUGH LIMIT IS PERMITTED.	FOR IMMINENT MATERIAL LIBERATION, REMOVE ENGINE IMMEDIATELY
MATERIAL BREAK THROUGH INTO INTERNAL CAVITY	A	NOT PERMITTED	NOT PERMITTED	REMOVE ENGINE IMMEDIATELY
	B	NOT PERMITTED	NOT PERMITTED	REMOVE ENGINE IMMEDIATELY
	C	NOT PERMITTED	ONE DEFECT PER BLADE CONSISTING OF PARTIAL TIP LOSS OR OPEN AREA TO .125 square inch (81. square mm) OPENING, INTO THE INTERNAL CAVITY. MAXIMUM OF FIVE BLADES PER ROTOR.	FOR IMMINENT MATERIAL LIBERATION, REMOVE ENGINE IMMEDIATELY

L-B1924 (0000)

BM5 72 00 00 6 KGZJ 02

Stage 2 HPT Blade Borescope Inspection Limits (Sheet 2)
Figure 658

OBSERVED CONDITION	BLADE INSPEC-TION AREA	MAXIMUM DAMAGE FOR REGULAR INTERVAL INSPECTION	MAXIMUM DAMAGE FOR REDUCED INTERVAL INSPECTION	IF THE LIMIT IS EXCEEDED, REMOVE ENGINE WITHIN 5 CYCLES OR AS NOTED BELOW
TRAILING EDGE COOLING AIR SLOT BLOCKAGE	A	A MAXIMUM OF ONE TRAILING EDGE COOLING AIR SLOT BLOCKED PER BLADE IS PERMITTED		REMOVE ENGINE IMMEDIATELY
	B AND C	A MAXIMUM OF TWO NON-ADJACENT TRAILING EDGE COOLING AIR SLOTS BLOCKED PER BLADE IS PERMITTED		REMOVE ENGINE IMMEDIATELY
BENT TIP	C	PERMITTED IF OTHER CONDITIONS ARE NOT EXCEEDED		REMOVE ENGINE IMMEDIATELY
TIP RUB OR PLASMA SPRAY LOSS	C	ANY AMOUNT IS ACCEPTABLE IF NOT RUBBED INTO THE INTERNAL CAVITY		REMOVE ENGINE IMMEDIATELY
LIBERATED BLADE PARENT MATERIAL	A, B AND C	NOT PERMITTED	NOT PERMITTED EXCEPT AS DEFINED FOR "MATERIAL BREAKTHROUGH INTO INTERNAL CAVITY" OBSERVED CONDITION	REMOVE ENGINE IMMEDIATELY

BM5 72 00 00 6 KGZS 03

L-B1925 (0105)
PW V

Stage 2 HPT Blade Borescope Inspection Limits (Sheet 3)
Figure 658

OBSERVED CONDITION	BLADE INSPEC-TION AREA	MAXIMUM DAMAGE FOR REGULAR INTERVAL INSPECTION	MAXIMUM DAMAGE FOR REDUCED INTERVAL INSPECTION	IF THE LIMIT IS EXCEEDED, REMOVE ENGINE WITHIN 5 CYCLES OR AS NOTED BELOW
AIRFOIL GROWTH (AS EVID-ENCED BY: BENT OR DISPLACED 2ND STAGE BLADE(S) RELATIVE TO ADJACENT BLADES IN ROTOR	A, B AND C	NOT PERMITTED SEE NOTE 1 IN TEXT	NOT PERMITTED SEE NOTE 1 IN TEXT	REMOVE ENGINE IMMEDIATELY
ABNORMAL/ EXCESSIVE TIP RUB				
WAVY/ DEFORMED TRAILING EDGE				
NECKING/ THINNING OF AIRFOIL PROFILE AT MIDSPAN REGION				
CRACKS IN THE MID-SPAN TRAILING EDGE COOLING HOLE OPENINGS				

L-D2090 (0105)
PW V

BM5 72 00 00 6 KGZU 00

Stage 2 HPT Blade Borescope Inspection Limits (Sheet 4)
Figure 658

8. Perform Borescope Inspection of Stage 3 LPT Vanes (AP-10)

A. Equipment and Materials
NOTE : See paragraph 1. B. for borescope equipment.

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
(2)	Torque Wrench
(3)	Gasket
(4)	Corrosion Resistant Steel Lockwire (MS9226-04) (Ref. 70-00-00)
(5)PWA86081	Puller (AP-10 Plug Assembly)
(6)PWA102757	Wedge, Block - Fan Blade, LPC (3 are necessary during windy conditions)
(7)Material No.P06-023	Lubricants (Ref. 70-00-00)
(8)Material No.P11-027	Cleaning Agents (Ref. 70-00-00)
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure (Ref. Fig. 659, 660, 661)
WARNING : DO NOT DO A BORESCOPE INSPECTION IF THE WIND IS MORE THAN 3 MPH (4.8 KPH). DURING WINDY CONDITIONS, THE N1 ROTOR CAN TURN (WINDMILL). THIS CAN CAUSE INJURY TO INSPECTION PERSONNEL AND DAMAGE TO BORESCOPE EQUIPMENT.
WARNING : INSTALL PWA102757 WEDGES BETWEEN THE FAN BLADES DURING MILD WIND, LESS THAN 3 MPH (4.8 KPH) CONDITIONS. IF YOU DO NOT INSTALL THE WEDGES DURING MILD WIND CONDITIONS, THE N1 ROTOR CAN TURN (WINDMILL). THIS CAN CAUSE INJURY TO INSPECTION PERSONNEL AND DAMAGE TO BORESCOPE EQUIPMENT.
(1)If there are mild wind conditions less than 3 miles per hour (4.8 KPH), install PWA102757 Wedges as follows.
(a)Do not install the PWA102757 Wedge if the wind is more than 3 miles per hour (4.8 KPH).
(b)Install two or three PWA102757 Wedges between several fan blades and the fan case at approximately the 6 o'clock location.
(c)Make sure the wedge is installed tight enough to prevent the fan blades from turning but they must not raise the fan blades up.
(d)The red warning streamer must go towards the front of the engine inlet.
(e)If it is necessary to turn the N1 rotor to complete the borescope inspection, you will have to remove the wedges, turn the fan rotor by hand and install the wedges again. Do this procedure again until the borescope inspection is complete.
(2)Remove lockwire, and two bolts from borescope access port AP-10 located on LPT case at 4.30 o'clock position. Using PWA86081 puller, remove as an assembly, the boss plug, plug stop (cover), spring washer, and cotter

pin.
Discard the gasket on boss plug.
CAUTION : TEMPERATURES IN AREAS TO BE BORESCOPED SHOULD BE PERMITTED TO COOL BELOW 150°F (65.6°C) FOLLOWING ENGINE OPERATION.
DAMAGE MAY RESULT TO BORESCOPE EQUIPMENT IF EQUIPMENT IS EXPOSED TO GASPATH OR METAL TEMPERATURES IN EXCESS OF 150°F (65.6°C).
AS A GUIDE, IF ADJACENT CASES ARE TO HOT TO TOUCH COMFORTABLY, BORESCOPE INSPECTION SHOULD BE DELAYED.

(3)Insert borescope through port and inspect stage 3 vanes for nicks, dents, cracks and other damage caused by passage of foreign material. (Ref. Fig. 660) for inspection limits.
NOTE : Borescope limiting access hole diameter specifications for AP-10 are provided in Table 601.
(a)If there has been a sudden increase in EGT, check for a possible missing or liberated LPT 3rd stage outer transition duct segment. No missing or liberated outer transition duct segments are permitted.

(4)After borescope inspection, reinstall as an assembly, the AP-10 plug, spring tension washer, plug stop, cotter pin and a new gasket. Install gasket into boss with split facing inward. (Ref. Fig. 661) and see Table 608 before installing this assembly.
CAUTION : MAKE CERTAIN THAT BORESCOPE PLUGS ARE CORRECTLY INSTALLED. A MISSING PLUG CAN CAUSE IMPORTANT DAMAGE TO COMPONENTS AND/OR NACELLE STRUCTURE.
NOTE : If plug, washer and plug stop (cover) have been disassembled, reassemble per step (4) procedure.

AP-10 Borescope Plug Installation Data
Table 608

AP Number and Location	Gasket Required	Bolts (2) Locking Method	Bolts (2) Replacement Lubricant	Bolts (2) Torque lbf. in. (m.daN)
AP-10 Stage 3 LPT Vanes	Yes ST1146-08	Lockwire (MS9226-04)	P06-023 Lubricants (Ref. 70-00-00)	54-60 (0.61-0.68)

(5)If required, assemble borescope plug, spring tension washer, plug stop (cover) and cotter pin.
NOTE : When plug, spring tension washer and cover are properly assembled and installed to turbine case, plug should be loaded inward, by spring washer, to seat in case boss.
(a)Place washer into cover recess so that washer OD contacts cover, and concave surface of washer is towards cover recess.
(b)Insert plug into cover and washer from washer side.
(c)Install cotter pin into hole in plug, with cotter pin head seated

firmly on flat side of plug. Bend cotter pin prongs so that head and prongs are firmly seated against plug.

(d)Install new gasket, split facing inward, into borescope boss on turbine case.

(6)Secure plug stop to AP-10 boss.

(a)Thoroughly clean bolt threads and AP-10 boss threads with Material No.P11-027 to remove carbon deposits and any deposits of previously applied Antigalling Compound.

(b)Treat threads of 2 bolts with Material No. P06-023. Remove excess Material.

(c)Secure plug to AP-10 borescope boss on case with 2 bolts (above). TORQUE and lockwire bolts per table 608.

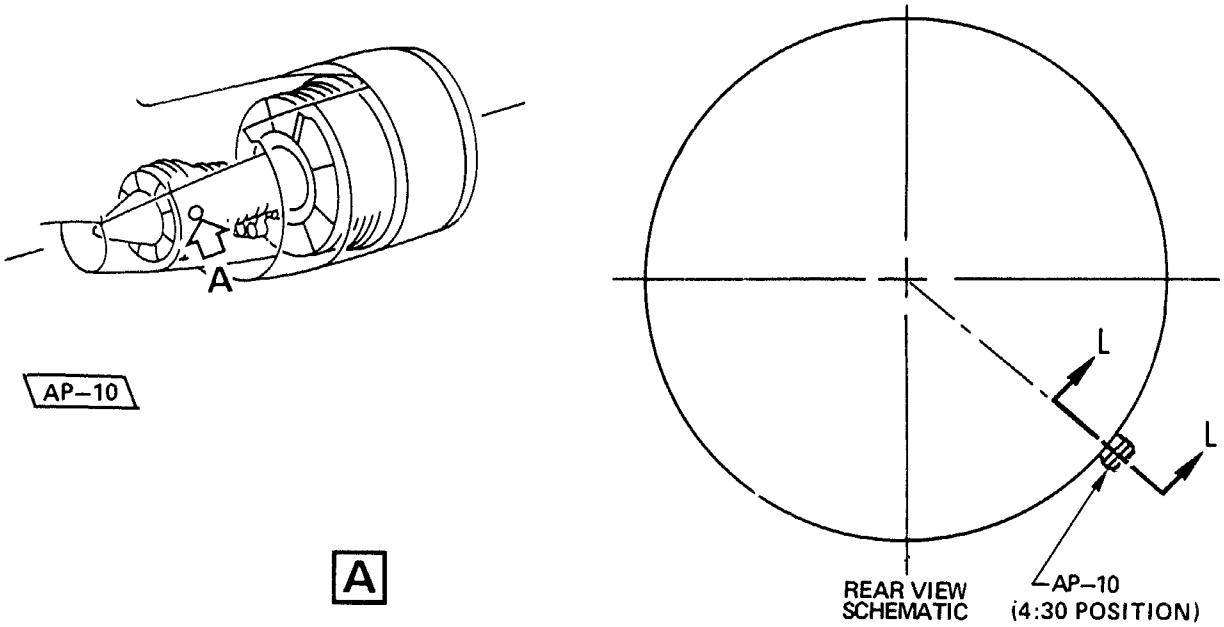
CAUTION : ALL THE PWA102757 WEDGES MUST BE REMOVED AFTER THE BORESCOPE INSPECTION IS COMPLETE.
IF THE WEDGES ARE NOT REMOVED, THE ENGINE WILL BE DAMAGED WHEN THE ENGINE IS STARTED.

(7)Carefully remove all the PWA102757 Wedges after all borescope inspections are complete.

D. Close-Up

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)CLose fan and thrust reverser cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).


A
AP–10
L
L
REAR VIEW SCHEMATIC
AP–10 (4:30 POSITION)
A
HPT STAGE 2 BLADE
LPT INLET DUCT
EXPENDABLE GASKET
LPT STAGE 3 VANE
AP–10 BOROSCOPE ACCESS PORT
LPT STAGE 3 BLADE
FLANGE N
TURBINE CASE COOLING AIR TUBE
RETAINING BOLTS (2)
TCC AIR TUBE
SECTION L–L (ROTATED)
SEE TABLE 601 FOR AP–10 DATA
REMOVE PLUG AP–10 ASSEMBLY PER TEXT INSTRUCTIONS TO VIEW REAR OF STAGE 2 HPT BLADE AND FRONT OF STAGE 3 LPT VANE.
AFTER BOROSCOPE INSPECTION REINSTALL PLUG ASSEMBLY PER INSTALLATION TABLE.
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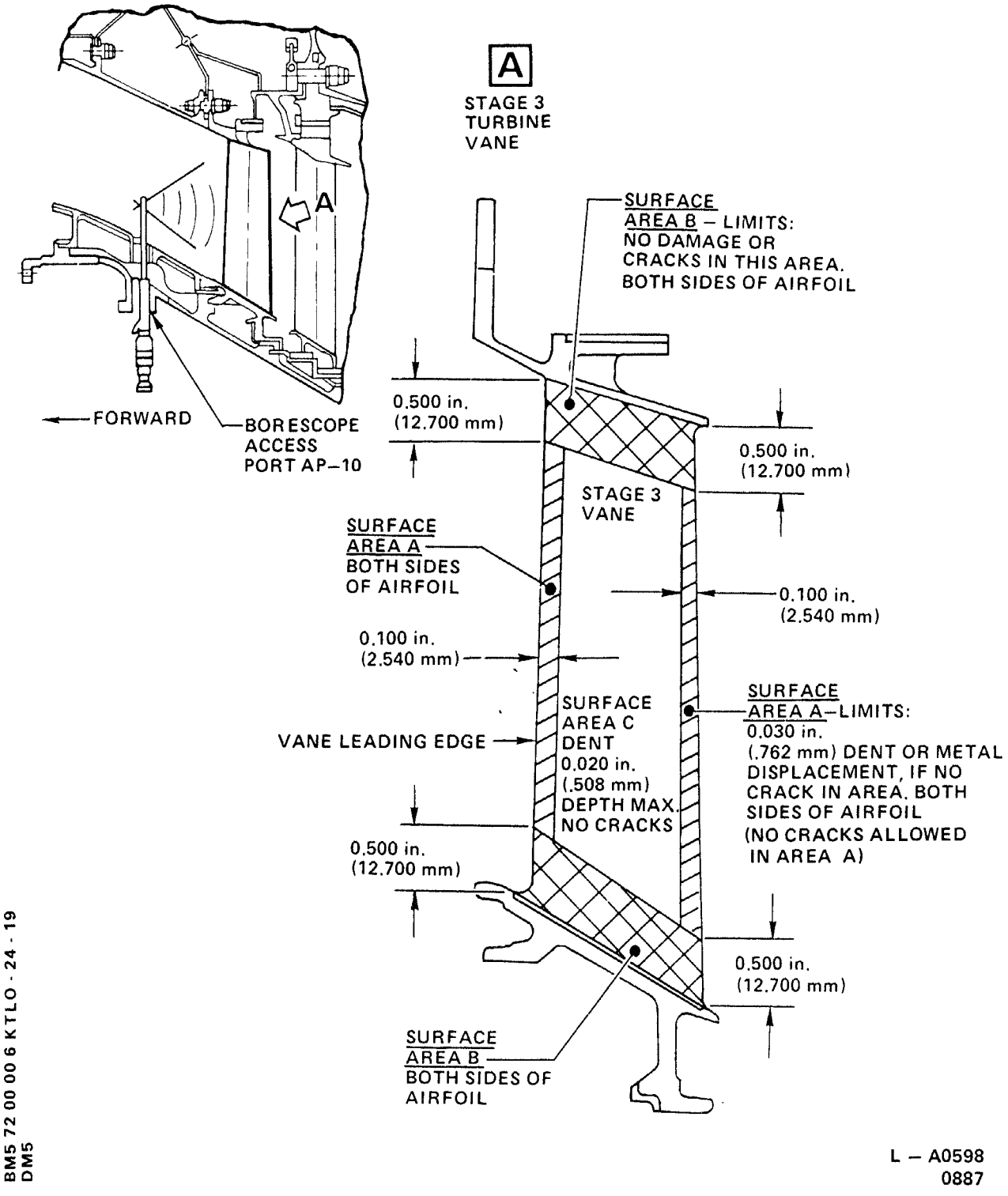
Stage 3 LPT Vane/Blade Borescope Access Port (AP-10) Location
Figure 659



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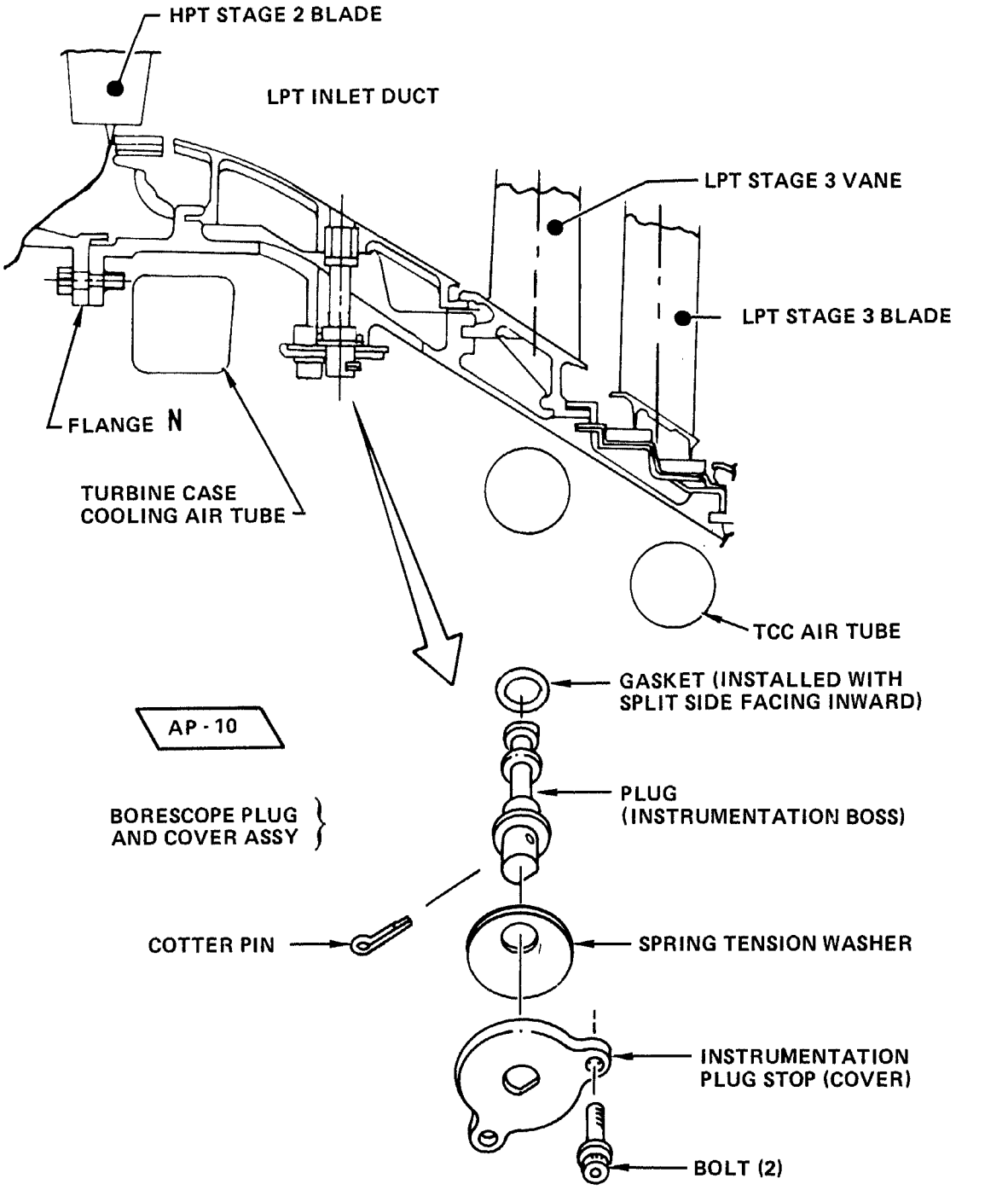
Stage 3 LPT Vane (AP-10) Borescope Viewing Vane Inspection Areas
Figure 660



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AP-10 Borescope Port Plug and Cover Assembly
Figure 661

9. Perform Borescope Inspection of Stage 3 LPT Blades (AP-10)

A. Equipment and Materials
NOTE : See paragraph 1.B. for borescope equipment.

ITEM	DESIGNATION
(1)	Gasket
(2)	Lockwire
(3)PWA86081	Puller (AP-10 Plug Assembly)
(4)PWA102757	Wedge, Block - Fan Blade, LPC (3 are necessary during windy conditions)
(5)Material No.P06-023	Lubricants (Ref. 70-00-00)
(6)Material No.P11-027	Cleaning Agents (Ref. 70-00-00)
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure (Ref. Fig. 659, 661, 662) and Table 608A
WARNING : DO NOT DO A BORESCOPE INSPECTION IF THE WIND IS MORE THAN 3 MPH (4.8 KPH). DURING WINDY CONDITIONS, THE N1 ROTOR CAN TURN (WINDMILL). THIS CAN CAUSE INJURY TO INSPECTION PERSONNEL AND DAMAGE TO BORESCOPE EQUIPMENT.
WARNING : INSTALL PWA102757 WEDGES BETWEEN THE FAN BLADES DURING MILD WIND, LESS THAN 3 MPH (4.8 KPH) CONDITIONS. IF YOU DO NOT INSTALL THE WEDGES DURING MILD WIND CONDITIONS, THE N1 ROTOR CAN TURN (WINDMILL). THIS CAN CAUSE INJURY TO INSPECTION PERSONNEL AND DAMAGE TO BORESCOPE EQUIPMENT.
(1)If there are mild wind conditions less than 3 miles per hour (4.8 KPH), install PWA102757 Wedges as follows.
(a)Do not install the PWA102757 Wedge if the wind is more than 3 miles per hour (4.8 KPH).
(b)Install two or three PWA102757 Wedges between several fan blades and the fan case at approximately the 6 o'clock location.
(c)Make sure the wedge is installed tight enough to prevent the fan blades from turning but they must not raise the fan blades up.
(d)The red warning streamer must go towards the front of the engine inlet.
(e)If it is necessary to turn the N1 rotor to complete the borescope inspection, you will have to remove the wedges, turn the fan rotor by hand and install the wedges again. Do this procedure again until the borescope inspection is complete.
(2)Remove lockwire, and two bolts from borescope access port AP-10 located on LPT case at 4:30 o'clock position.
Using PWA86081 puller, remove as an assembly, the boss plug, plug stop (cover), spring washer, and cotter pin. Discard gasket on boss plug.
CAUTION : TEMPERATURES IN AREAS TO BE BORESCOPED SHOULD BE PERMITTED TO COOL TO BELOW 150° F (65.6° C) FOLLOWING ENGINE OPERATION.

DAMAGE MAY RESULT TO BORESCOPE EQUIPMENT IF EQUIPMENT IS EXPOSED TO GASPATH OR METAL TEMPERATURE IN EXCESS OF 150° F (65.6° C). AS A GUIDE - IF ADJACENT CASES ARE TOO HOT TO TOUCH COMFORTABLY, INSPECTION SHOULD BE DELAYED.

(3)Insert borescope through port and inspect Stage 3 blades for nicks, dents, cracks and other damage caused by passage of foreigh material. (Ref. Fig. 662) and Table 608A for inspection limits.

NOTE : Borescope limiting access hole diameter specifications for AP-10 are provided in Table 601.

(a)If there has been a sudden increase in EGT, check for a possible missing or liberated LPT 3rd stage outer transition duct segment. No missing or liberated outer transition duct segments are permitted.

(4)After borescope inspection, install as an assembly, the AP-10 plug, spring tension washer, plug stop, cotter pin and a new gasket. Install gasket into boss with split facing inward. (Ref. Fig. 661) and see Table 608 before installing this assembly.

CAUTION : MAKE CERTAIN THAT BORESCOPE PLUGS ARE CORRECTLY INSTALLED. A MISSING PLUG CAN CAUSE IMPORTANT DAMAGE TO COMPONENTS AND/OR NACELLE STRUCTURE.

NOTE : If plug, washer and plug stop (cover) have been disassembled, reassemble per step (4) procedure.

(a)If required, assemble borescope plug, spring tension washer, plug stop (cover) and cotter pin.

NOTE : When plug, spring tension washer and cover are properly assembled and installed to turbine case, plug should be loaded inward, by spring washer, to seat in case boss.

1 Place washer into cover recess so that washer OD contacts cover, and concave surface of washer is towards cover recess.

2 Insert plug into cover and washer from washer side.

3 Install cotter pin into hole in plug, with cotter pin head seated firmly on flat side of plug. Bend cotter pin prongs so that head and prongs are firmly seated against plug.

4 Install new gasket, split facing inward, into borescope boss on turbine case.

(b)Install plug stop to boss and torque bolts.

1 Thoroughly clean bolt threads and AP-10 boss threads with Material No. P11-027 to remove carbon deposits and any deposits of previously applied Antigalling Compound.

2 Treat threads of two bolts with Material No. P06-023. Remove excess compound.

3 Secure plug to AP-10 borescope boss on case with two bolts (above). TORQUE and lockwire bolts per Table 608.

NOTE 1 : (Ref. Fig. 662)

CAUTION : ALL THE PWA102757 WEDGES MUST BE REMOVED AFTER THE BORESCOPE INSPECTION IS COMPLETE.
IF THE WEDGES ARE NOT REMOVED, THE ENGINE WILL BE DAMAGED WHEN THE ENGINE IS STARTED.

(5)Carefully remove all the PWA102757 Wedges after all borescope inspections are complete.

Stage 3 LPT Blade Borescope Inspection Limits

Table 608A

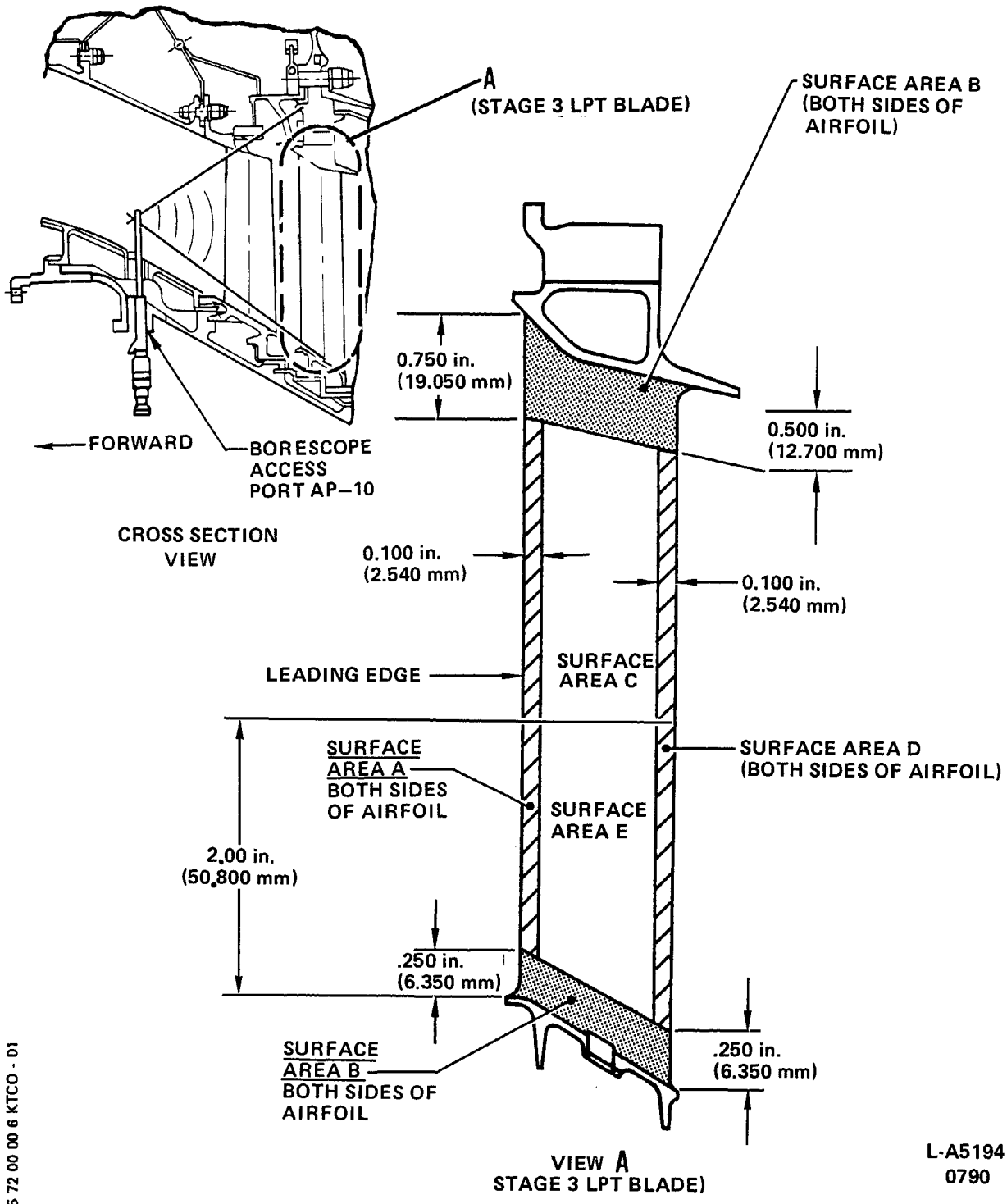
INSPECT	SERVICEABLE LIMITS	REMOVE ENGINE WITHIN 5 CYCLES LIMITS
CAUTION : IF DAMAGE IS FOUND THAT EXCEEDS THE REMOVE ENGINE WITHIN 5 CYCLES LIMITS, THE ENGINE IS NOT SERVICEABLE AND IT MUST BE REMOVED IMMEDIALETLY. THE FOLLOWING LIMITS ARE APPLICABLE ON A CONTINUE-IN-SERVICE BASIS ONLY. THE LIMITS ARE BASED ON PART STRUCTURAL REQUIREMENTS AND DOES NOT IMPLY THAT ENGINE PERFORMANCE, STABILITY, OPERATING LIMITS, OR PART REPAIRABILITY WILL BE MAINTAINED.		
(1)Blade area A for : (See NOTE 1)		
Cracks, Tears	None	None
Nicks	Any quantity to 0.015 in. (0.381 mm) maximum depth.	Any quantity to 0.050 in. (1.270 mm) maximum depth.
Dents (Round bottomed)	Any quantity to 0.020 in. (0.508 mm) maximum depth or 0.125 in. (3.175 mm) diameter metal displacement	Any quantity to 0.050 in. (1.270 mm) maximum depth
Loss of coating	Any quantity	Any quantity
Burning and erosion	Any quantity to 0.020 in. (0.508 mm) depth and 0.300 in. (7.620 mm) diameter maximum.	Any exceedance of serviceable limit.
Sulfidation	None	A single area on each blade to 0.200 Square in. (5.080 square mm) There can not be any associated material loss. Five blades maximum on each rotor can have sulfidation to the above limits.
Blade Growth	None	None

INSPECT	SERVICEABLE LIMITS	REMOVE ENGINE WITHIN 5 CYCLES LIMITS
NOTE : Blade growth is shown as necking down or thinning of the blade airfoil.		
(2)Area B for : (See NOTE 1)		
Cracks, Tears	None	None
Nicks	None	Any quantity to 0.030 in. (0.762 mm) maximum depth.
Dents (Round bottomed)	Any quantity to 0.010 in. (0.254 mm) maximum depth or 0.125 in. (3.175 mm) diameter metal displacement	Any quantity to 0.030 in. (0.762 mm) maximum depth
Loss of coating	Any quantity	Any quantity
Burning and erosion	Any quantity to 0.010 in. (0.254 mm) depth and 0.300 in. (7.620 mm) diameter maximum.	Any exceedance of serviceable limit.
Sulfidation	None	A single area on each blade to 0.200 Square in. (5.080 square mm) There can not be any associated material loss.
		Five blades maximum on each rotor stage can have sulfidation to the above limits.
(3)Blade area C for : (See NOTE 1)		
Cracks, Tears	None	None

INSPECT	SERVICEABLE LIMITS	REMOVE ENGINE WITHIN 5 CYCLES LIMITS
Nicks	Any quantity to 0.015 in. (0.381 mm) maximum depth.	Any quantity to 0.050 in. (1.270 mm) maximum depth.
Dents (Round bottomed)	Any quantity to 0.020 in. (0.508 mm) maximum depth or 0.125 in. (3.175 mm) diameter metal displacement	Any quantity to 0.050 in. (1.270 mm) maximum depth
Loss of coating	Any quantity	Any quantity
Burning and erosion	Any quantity to 0.020 in. (0.508 mm) depth and 0.300 in. (7.620 mm) diameter maximum.	Any exceedance of serviceable limit.
Sulfidation	None	A single area on each blade to 0.200 Square in. (5.080 square mm) There can not be any associated material loss.
		Five blades maximum on each rotor stage can have sulfidation to the above limits.
(4)Blade area D for : (See NOTE 1)		
Cracks, Tears	None	A tight radial crack or tear to 0.100 in. 2.540 mm) maximum length
Nicks	Any quantity to 0.015 in. (0.381 mm) maximum depth.	Any quantity to 0.050 in. (1.270 mm) maximum depth.
Dents (Round bottomed)	Any quantity to 0.020 in. (0.508 mm) maximum depth or	Any quantity to 0.050 in. (1.270 mm) maximum depth

INSPECT	SERVICEABLE LIMITS	REMOVE ENGINE WITHIN 5 CYCLES LIMITS
	0.125 in. (3.175 mm) diameter metal displacement	
Loss of coating	Any quantity	Any quantity
Burning and erosion	Any quantity to 0.020 in. (0.508 mm) depth and 0.300 in. (7.620 mm) diameter maximum.	Any exceedance of serviceable limit.
Sulfidation	None	A single area on each blade to 0.200 Square in. (5.080 square mm) There can not be any associated material loss.
		Five blades maximum on each rotor stage can have sulfidation to the above limits.
CAUTION : WHERE DAMAGE EXCEEDS THE SERVICEABLE LIMITS AND PART FAILURE OR MATERIAL LIBERATION IS IMMINENT, REMOVE ENGINE IMMEDIATELY. (5)Blade area E for : (See NOTE 1)		
Cracks, Tears	None	None
Nicks	Any quantity to 0.015 in. (0.381 mm) maximum depth.	Any quantity to 0.050 in. (1.270 mm) maximum depth.
Dents (Round bottomed, a scuffed surface texture is acceptable)	Any quantity less than 0.100 in. (2.54 mm) diameter to a 0.020 in. (0.508 mm) depth or a single dent 0.100 in. (2.54 mm) to 0.500 in. (12.70 mm) diameter to a 0.030 in. (0.762 mm)	Any exceedance of Serviceable limit

INSPECT	SERVICEABLE LIMITS	REMOVE ENGINE WITHIN 5 CYCLES LIMITS
	depth.	
Loss of coating	Any quantity	
Burning and erosion	Any quantity to 0.020 in. (0.508 mm) depth and 0.300 in. (7.620 mm) diameter maximum	Any exceedance of serviceable limit.
Sulfidation	None	A single area on each blade to 0.200 Square in. (5.080 square mm) There can not be any associated crack or material loss.
		Five blades maximum on each rotor can have sulfidation to the above limits.



Stage 3 LPT Blade AP-10 Borescope Viewing/Blade Inspection Areas
Figure 662

10.Perform Visual Inspection of Stage 6 HPT Blades and Stage 6 HPT Vanes

A. For inspection of Stage 6 HPT blades (Ref. 72-52-01, P. Block 601).

B. For inspection of Stage 6 HPT vanes (Ref. 72-52-02, P. Block 601).

11.Perform Visual Inspection of Turbine Exhaust Case Assembly

A. For inspection of turbine exhaust case (exterior) (Ref. 72-58-01, P. Block 601).

B. For inspection of turbine exhaust case (gaspath area) (Ref. 72-58-01, P. Block 601).

12.Perform Visual Inspection of Low Pressure Turbine

A. For inspection of stage 6 LPT (outer) airsealing, ring segment assembly (Ref. 72-52-03, P. Block 601).

13.Perform Oil Overtemperature Inspection

A. Equipment and Materials

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
(2)	Bergen Mechanical Crimper (Optional) Model M303, M305 or M307
(3)PWA85307	Jackscrew, Puller
(4)PWA85518	Puller
(5)PWA86018	Adapter, Oil Sampler
(6)Material No.P03-001	Oils (Ref. 70-00-00)
(7)Material No.P05-289	Special Materials (Ref. 70-00-00)
(8)Material No.P05-291	Special Materials (Ref. 70-00-00)
(9)Material No.P05-292	Special Materials (Ref. 70-00-00)
10)Material No.P06-054	Lubricants (Ref. 70-00-00)
11)	Packings
12)	Torque Wrench
13)	Jackscrews (190-32, 8 required)
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 79-21-07, P. Block 401	Fuel/Oil Cooler Bypass Valve
- 12-13-79, P. Block 1	Engines (Engine Oil System)
- 79-21-12, P. Block 401	Air/Oil Heat Exchanger and Valve
- 72-52-03, P. Block 601	Stage 6 LPT Vane
- 79-22-03, P. Block 401	Magnetic Plug

B. Introduction

(1)See Table 609 for necessary procedures

High Oil Temperature Conditions and Procedures

Table 609

RANGE OF HIGH OIL TEMPERATURE	LENGTH OF HIGH TEMPERATURE	CONDITIONS OF ENGINE OPERATION	STEPS YOU MUST DO BEFORE YOU CAN USE THE ENGINE
325° - 350°F (163° - 177°C)	Less than 20 minutes	During a change from high power*	(1) None. Engine operation is correct.
325° - 350°F (163° - 177°C)	More than 20 minutes	Steady state operation	(1) Do "Inspections For Moderately High Temperature". (2) Correct the cause of the problem.
351° - 400°F (177° - 204°C)	Any length of time	Any conditions of operation	(3) Correct any damage that the high temperature caused.
400°F+ (204,4°C)+	Any length of time	Any conditions of operation	(1) Do "Inspections For Moderately High Temperature". (2) Do "Inspections For Very High Temperature" (3) Correct the cause of the problem (4) Correct any engine damage that the high temperature caused.

* High oil temperature and low fuel flow

C. Inspections for Moderately High Temperature (Ref. Fig. 663)
(1)Examine the data from the aircraft indicating system that is related to :
(a)The engine oil system.
(b)The integrated-drive generator system (IDGS).
(2)Examine the instruments for correct operation.
(3)Ref. 71-00-00, P. Block 501 - Test No. 7.
(a)Examine the results for FADEC/Fuel/Oil/System defects.
(4)Do a check of the fuel/oil-cooler bypass valve.
(a)Remove the old valve. Install a new one.
(Ref. 79-21-07, P. Block 401).
(b)(Ref. 71-00-00, P. Block 501- Test No.4)
1 Do not do the acceleration/deceleration test.
2 Write down the new oil temperature data.
(c)Compare the new oil temperature data :
1 With the data from before replacement of the valve.
2 With the data from an engine which has correct temperature.
(d)If the oil temperature data from the test is satisfactory, the removed

by pass valve was defective.

(5)Examine the engine air/oil heat exchanger and valve for satisfactory operation. (The air/oil heat exchanger and valve is referred to as the "unit"). (Ref. Fig. 663) (Sheet 1/10).

(a)Disconnect W3P17. When W3P17 is disconnected, the unit is in the "open" position.

(b)(Ref. 71-00-00, P. Block 501 - Test No. 4.).

1 Do not do the acceleration/deceleration test.

2 Write down the new oil temperature data.

(c)Compare the new oil temperature data :

1 With the data from before W3P17 was disconnected.

2 With the data from an engine which has correct temperature.

(d)If the oil temperature data from the test is much better than the data from before, the removed valve is defective (Ref. 79-21-12, P. Block 401).

(6)Examine the oil system for contamination. (see para 14).

(a)Do not do the "Hydraulic Fluid Contamination Inspection".

NOTE : The procedures to drain and flush that are in paragraph 14 are also in the procedures that follow. You will want to schedule operations to keep to a minimum the number of times you do the same operation.

(7)Get a sample of oil.

(a)Use PWA86018 adapter

1 Remove the magnetic probe in the oil tank (Ref. 79-22-03, P. Block 401).

2 Install (PWA86018) adapter in the hole for the magnetic probe.

3 Get a sample of oil.

(b)Examine the oil. If the answer to the three questions that follow is "no", do not continue the inspections. If the answer to any of the questions is "yes", do all the inspections in this section (Ref. to SB 238 for oil quality limits).

1 Look at the color. Is the oil much darker than usual ?

2 Is the oil more viscous ?

3 Has the Total Acid Number (TAN) increased ?

(c)Examine the main gearbox for discoloration, distortion and burns. None is permitted. If there are any indications of this type of damage, remove and repair the engine.

(d)Drain the engine. (Ref. 12-13-79, P. Block 1).

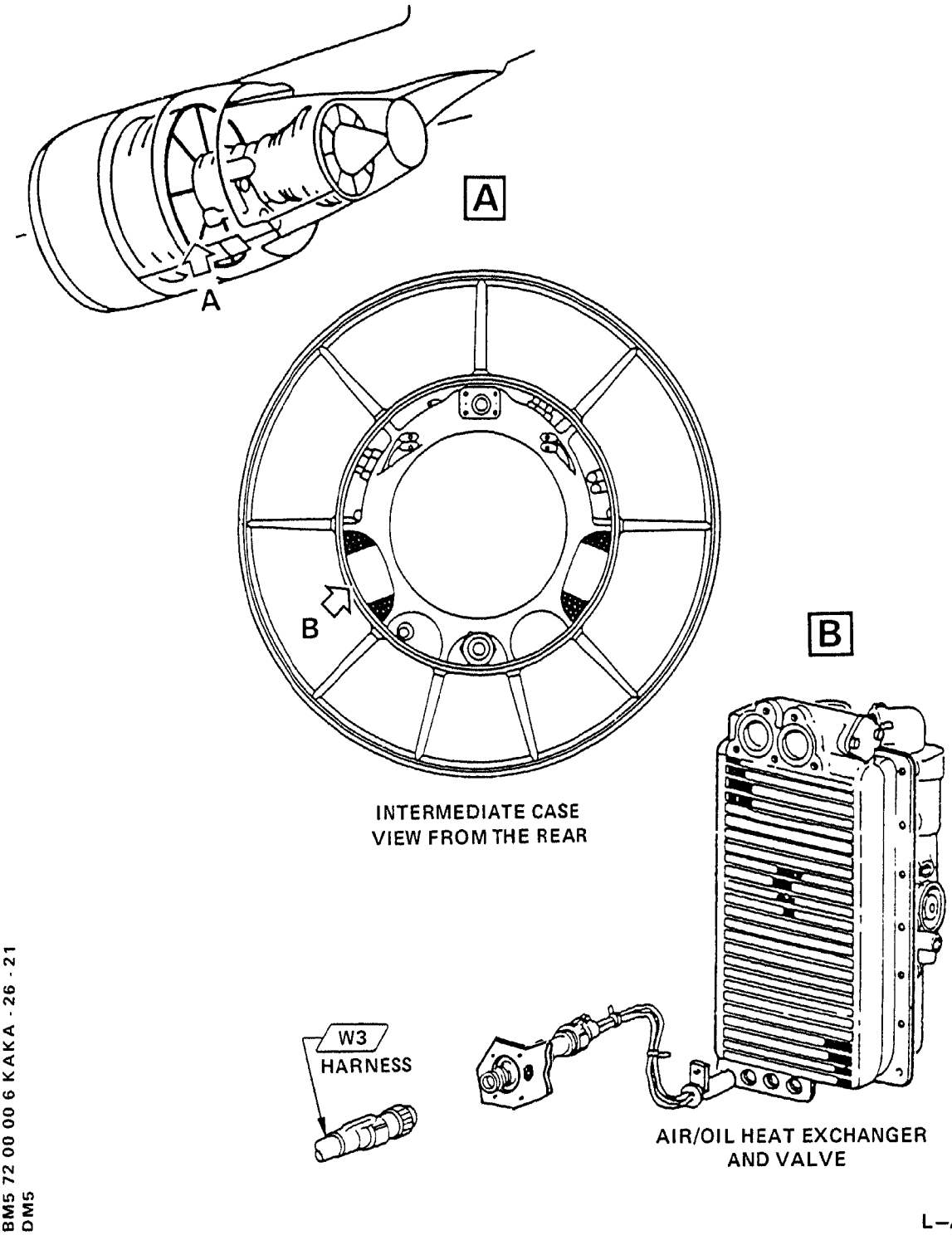
NOTE : The procedures that follow will let you examine the engine for coke and deterioration of packings. Coke and packings with deterioration are possible indications of clogged oil nozzles or defective carbon seal assemblies. These two conditions can cause high oil temperature.

(e)Look in the angle gearbox. (Ref. Fig. 663) (Sheets 2/10 and 3/10).

1 Open the angle gearbox.

- Remove the fan exit liner segment (inner rear) that is at 6 o'clock (Ref. 72-23-05, P. Block 401).
- Remove the retaining ring that keeps the plug in the angle-gearbox cover-assembly installed.
- Remove the plug. Use PWA85518 puller.

2 Examine the internal part of the angle gearbox.



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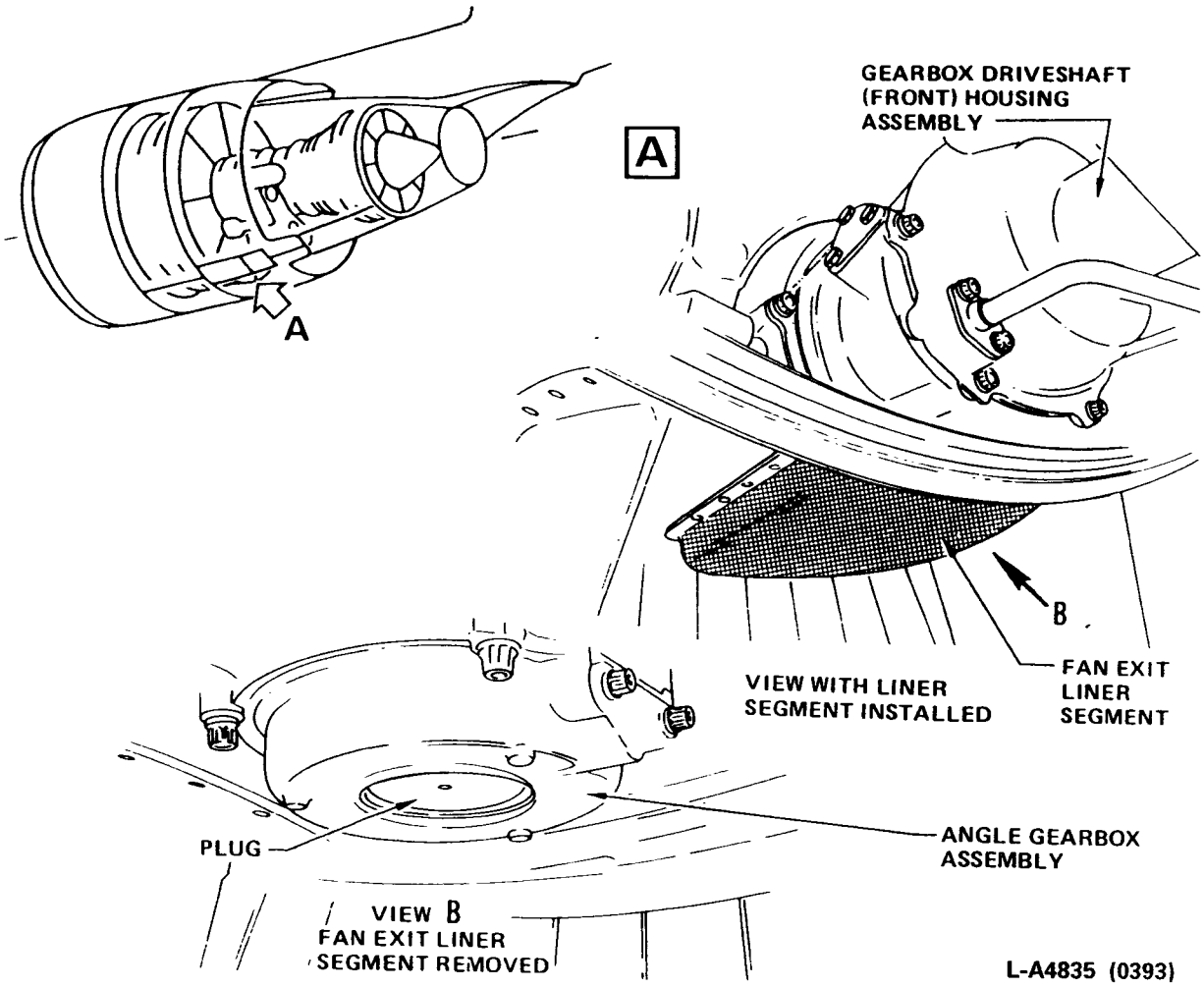
Location of the Air/Oil Heat Exchanger and Valve (Sheet 1/10)
Figure 663



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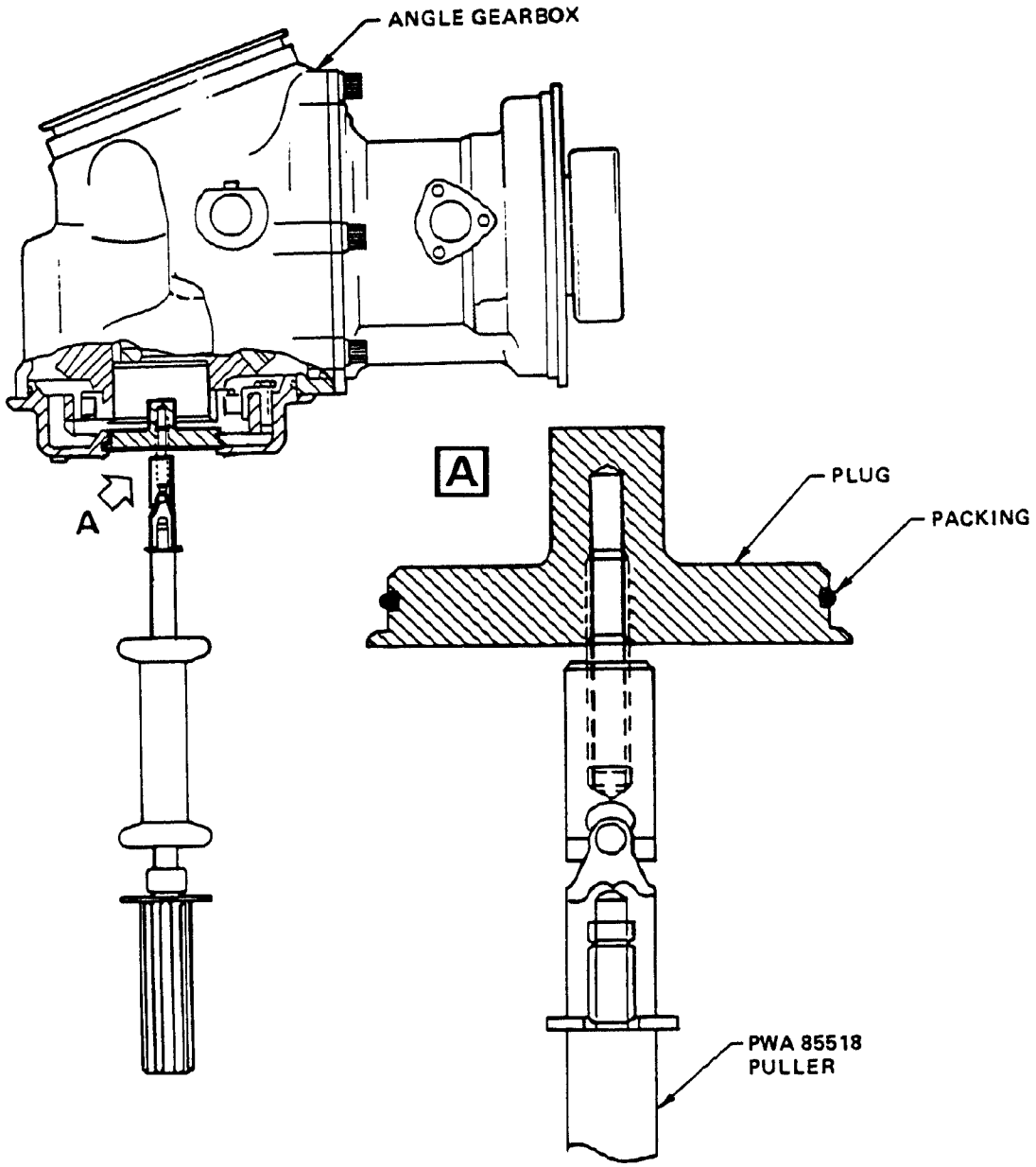
Access to Angle Gearbox (Sheet 2/10)
Figure 663



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Use of Puller (Sheet 3/10)
Figure 663

- Examine the packing that is on the plug for deterioration.
- Examine the gears for coke.

3 If you find coke, the No. 1, 1.5, and 2 bearing-compartment carbon seals and/or oil nozzles are possibly damaged. Remove and repair the engine.

4 If you do not find coke, close the angle gearbox.

- Lubricate a new packing for the plug with Material No.P03-001.
- Install the packing on the plug.
- Install the plug in the angle-gearbox cover assembly.
- Install the retaining ring.
- Install the fan exit liner segment (inner rear) that you removed (Ref. 72-23-05, P. Block 401).

(f)Look in the No. 4 bearing compartment.
(Ref. Fig. 663) (Sheets 4/10 and 5/10)

1 Open the No. 4 bearing compartment.

- Remove the bolts (3) that attach the No. 4 bearing shield (4) to the rear inner flange of the turbine exhaust case. Remove the shield (4).
- Remove the No. 4 bearing heat shield (5).
- For No. 4 bearing cover (2) that has six small tapped holes (pre SB PW4ENG 72-385), install a PWA 85307 jackscrew puller to the inner bolt hole flange of the exhaust case. Attach the detail channel to the case with the two detail bolts, washers and nuts. Put the small plate of the puller over the tapped holes and attach with the six detail knurled screws. Turn the jackscrew T handle to disengage the cover from the exhaust case. Remove the jackscrew puller and the cover from the exhaust case. Remove the jackscrew puller from the cover.
- For No. 4 bearing cover (2) that has eight jackscrew holes (post SB PW4ENG 72-385),install and evenly tighten eight (0.190 - 32) jackscrews to remove the cover.

NOTE : (Post SB PW4ENG 79-76) It will be necessary to angle the cover and heatshield to clear the No. 4 bearing oil pressure tube.

- Discard the packing (1).

2 Examine the internal part of the No. 4 bearing compartment.

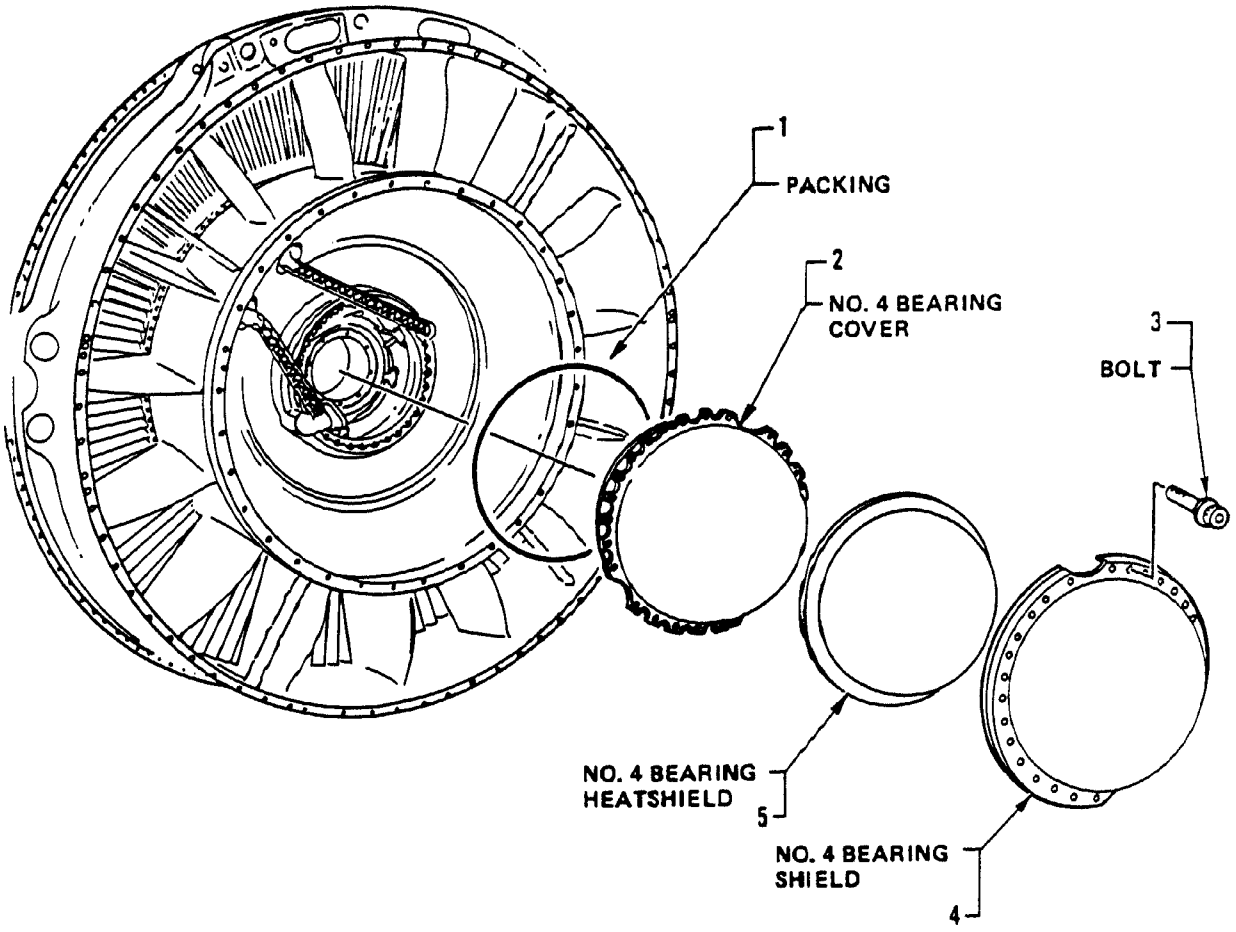
- Examine the packing for signs of deterioration.
- Examine the cover for signs of coke.
- Look in the compartment for signs of coke.

3 If you find coke, the No. 4 bearing carbon seal and/or oil nozzle is possibly damaged. Remove and repair the engine.

4 If you do not find coke, close the No. 4 bearing compartment.

CAUTION : YOU MUST APPLY ENGINE OIL FULLY TO THE COVER PACKING OR YOU WILL CUT THE PACKING DURING INSTALLATION. A CUT PACKING WILL CAUSE SUBSEQUENT OIL LOSS AND CAN CAUSE AN IN-FLIGHT SHUTDOWN.

CAUTION : INSTALL THE COVER INTO POSITION USING FOUR WORK BOLTS EQUALLY SPACED AROUND THE COVER. TIGHTEN THE BOLTS EQUALLY IN SMALL INCREMENTS TO PULL THE COVER INTO POSITION EQUALLY. MONITOR THE ENGAGEMENT OF THE COVER TO MAKE SURE THAT THE PACKING IS NOT CUT DURING INSTALLATION. A CUT PACKING WILL



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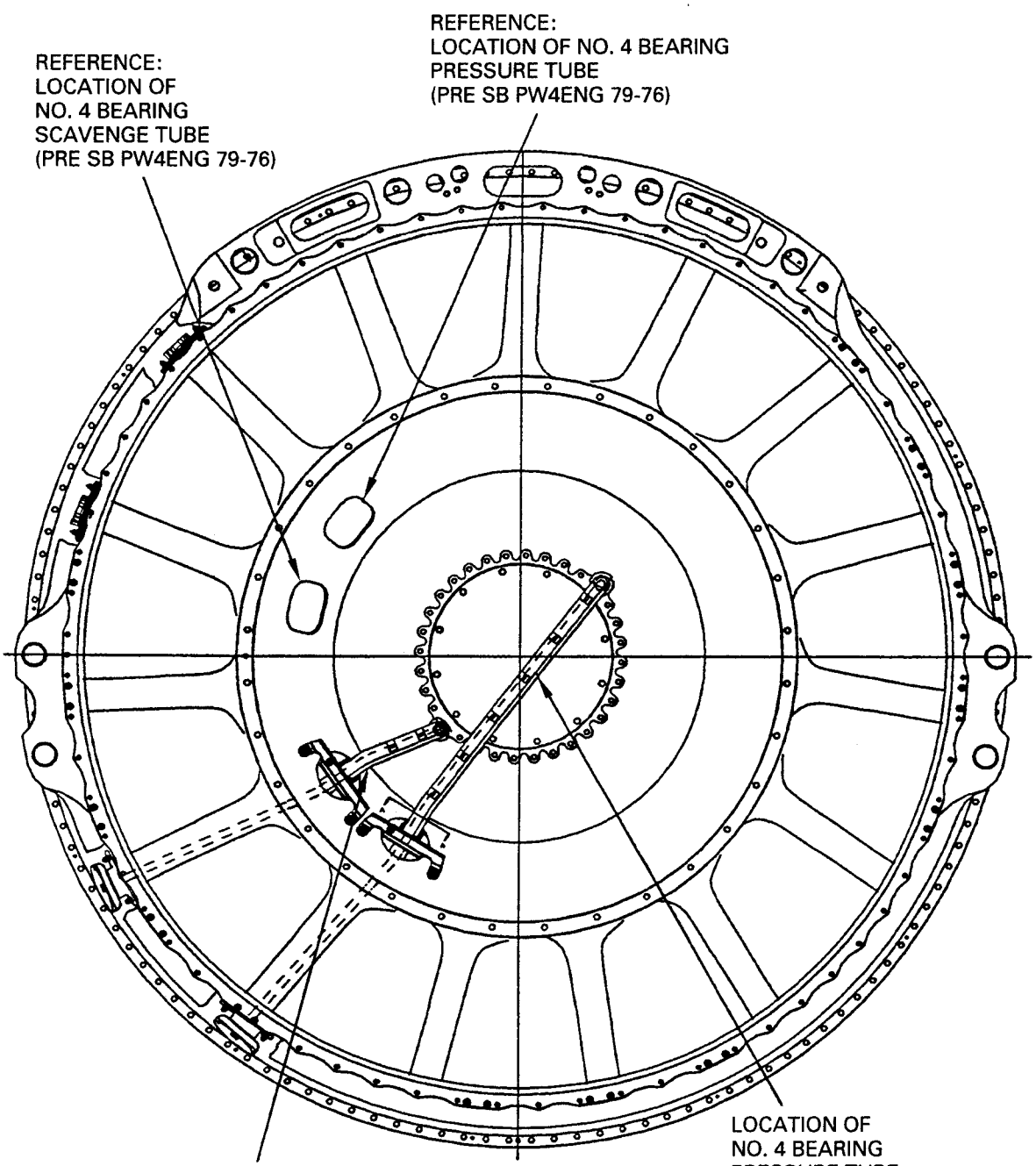
No. 4 Bearing Shield and Cover - Removal/Installation
(Pre SB PW4 ENG 79-76) (Sheet 4/10)
Figure 663



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No. 4 Bearing Shield and Cover - Removal/Installation
(Post SB PW4 ENG 79-76) (Sheet 5/10)
Figure 663

CAUSE SUBSEQUENT OIL LOSS AND CAN CAUSE AN IN-FLIGHT SHUTDOWN.

- Apply Engine Oil (Material No.P03-001) fully to the new packing (1).
- Install the new packing into the groove at the rear flange of the No. 4 bearing cover.
- Install the cover into the rear inner flange of the exhaust case.
- Install four work bolts equally spaced around the cover.
- Tighten the bolts equally in small increments to pull the cover into position equally.
- Monitor the engagement of the cover to make sure the packing is not cut.
- Remove the work bolts.
- Put the heat shield (5) in the recess in the shield (4).
- Lubricate the threads of 30 bolts (3) with Material No.P03-001.
- Attach the shield with the bolts. TORQUE the bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

NOTE : (Post SB PW4ENG 79-76) It will be necessary to angle the cover and heatshield to clear the No. 4 bearing oil pressure tube.

(g)Examine the No. 3 bearing oil scavenge manifold assembly (LR04) for coke and other deterioration as follows :

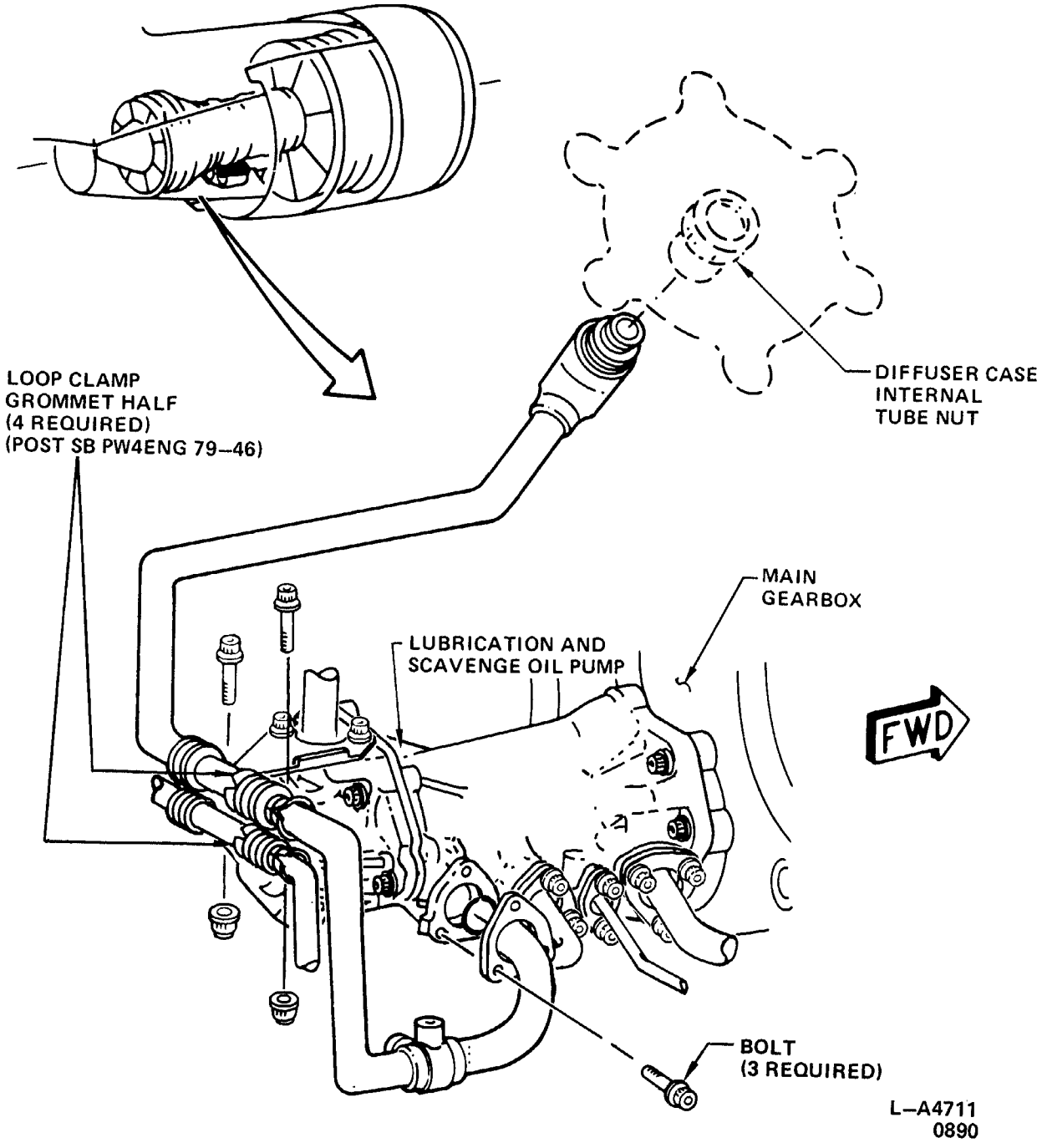
1 (Pre SB PW4ENG 79-75) Remove the (LR04) manifold assembly as follows : (Ref. Fig. 663) (Sheet 6/10).
- Disconnect the harness connector from the manifold assembly.
- Remove the lockwire. Disconnect the nut from the manifold elbow that is on the diffuser case.
- Remove the bolts that attach the manifold to the oil pump port.
- Remove the clamp bolt and nut that attach the manifold.
- Remove the manifold.
- Discard the packing.

2 (Post SB PW4ENG 79-75) Remove the scavenge hose and manifold assembly (LR04) as follows : (Ref. Fig. 663) (Sheets 7/10 thru 9/10).
- Disconnect the W5P13 connector from the probe.
- Remove the lockwire. Disconnect the nut from the hose and manifold assembly elbow that is on the diffuser case.
- Remove the bolts that attach the hose and manifold assembly to the oil pump port.
- Remove the clamp bolts and nuts that attach the hose and manifold assembly.
- Remove the manifold. Install the protection covers.
- Discard the packing.

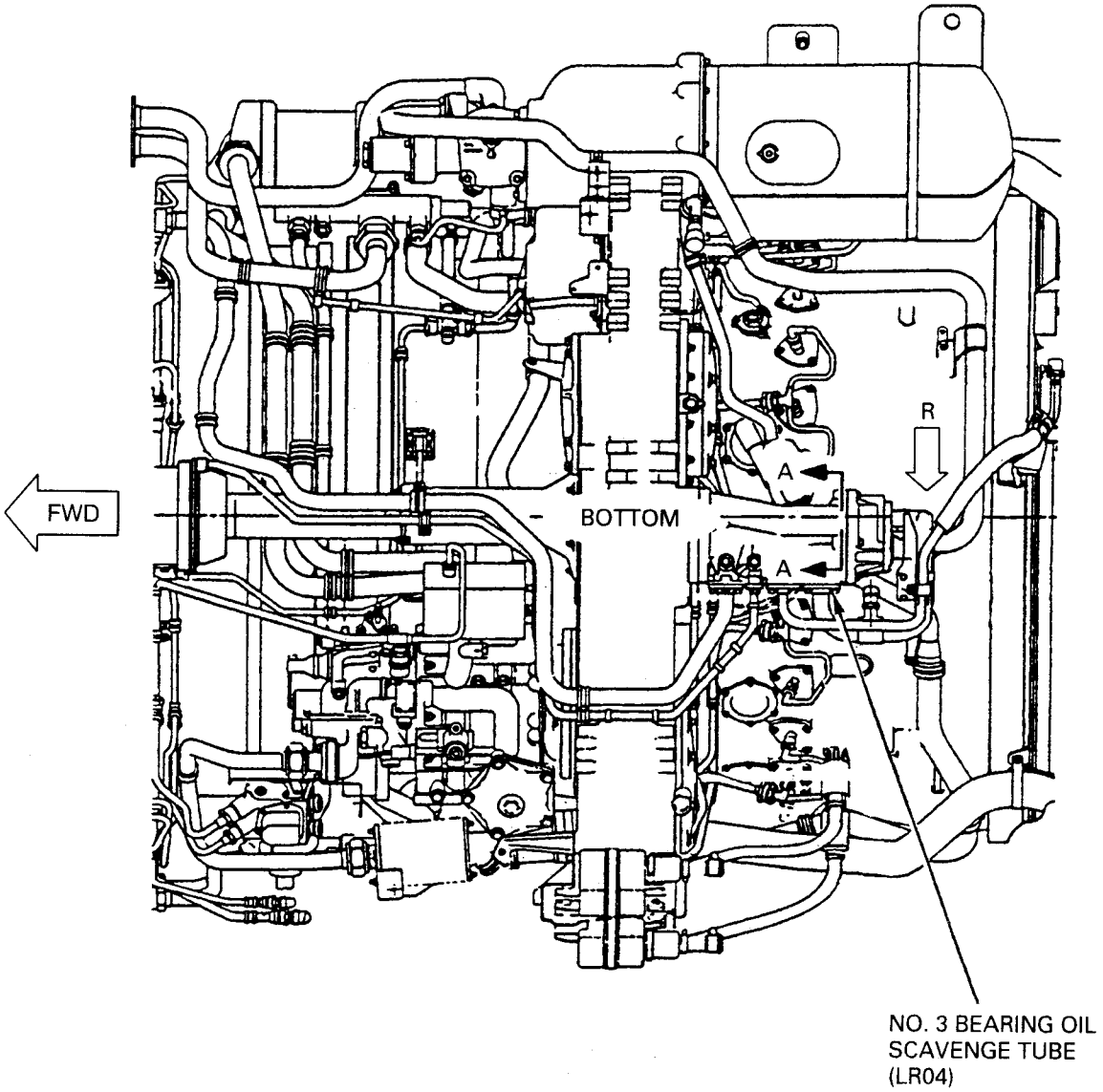
3 Look for coke in the manifold and in the diffuser case internal tube.

4 If you find coke in the manifold, the No. 3 bearing carbon seals or oil nozzle are possibly damaged. Remove and repair the engine.

5 (Pre SB PW4ENG 79-75) If you do not find coke in the manifold, install the (LR04) manifold as follows : (Ref. Fig. 663) (Sheet 6/10).
- Lubricate with Material No.P06-054 the threads of the bolts that will go into the oil pump
- Lubricate with Material No.P03-001



No. 3 Bearing Oil - Scavenge Manifold
Removal/Installation (Sheet 6/10)
Figure 663



ENGINE BOTTOM VIEW

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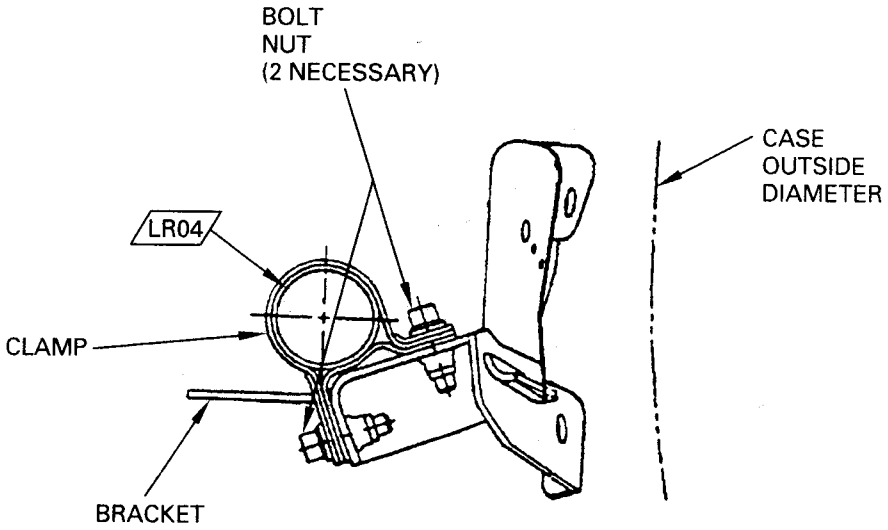
No. 3 Bearing Scavenge Hose and Manifold Assembly
Removal/Installation (Post SB PW4ENG 79-75) (Sheet 7/10)
Figure 663



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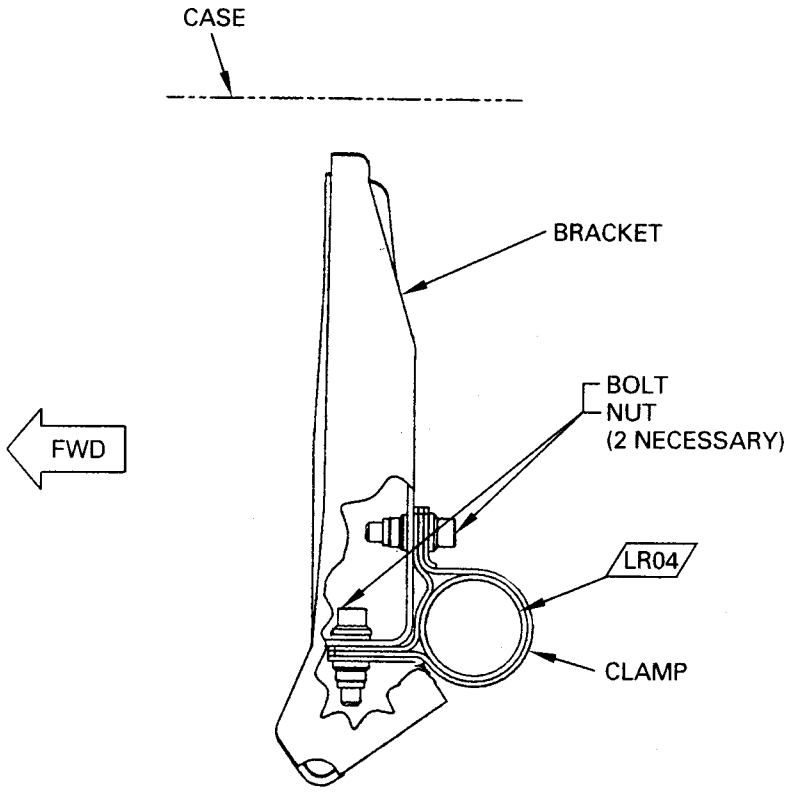
No. 3 Bearing Scavenge Hose and Manifold Assembly
Removal/Installation (Post SB PW4ENG 79-75) (Sheet 8/10)
Figure 663



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No. 3 Bearing Scavenge Hose and Manifold Assembly
Removal/Installation (Post SB PW4ENG 79-75) (Sheet 9/10)
Figure 663

. The threads of all other bolts
. A packing
. The threads of the manifold elbow

- Install the packing in the packing groove near the flange of the manifold.
- Install the manifold, at one end, to the tube nut of the diffuser case internal tube. Tighten the tube nut by hand.
- Attach the manifold, at the other end, to the oil pump port with bolts. Tighten the bolts by hand.
- Attach the tube and manifold with clamps, bolts and nuts.
  NOTE : Make sure that the (clip-on) loop clamp grommet halves are on the tubes at the correct clamp location (Post SB PW4 ENG 79-46 only). See the clamp views.
- TORQUE the bolts/nuts to these torques :
  . Clamp bolt to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).
  . Tube nut to between 650 and 700 lbf.in. (7.34 and 7.90 m.daN).
  . Other bolts to between 62 and 72 lbf.in. (0.70 and 0.81 m.daN).
- Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) in the tube nut.

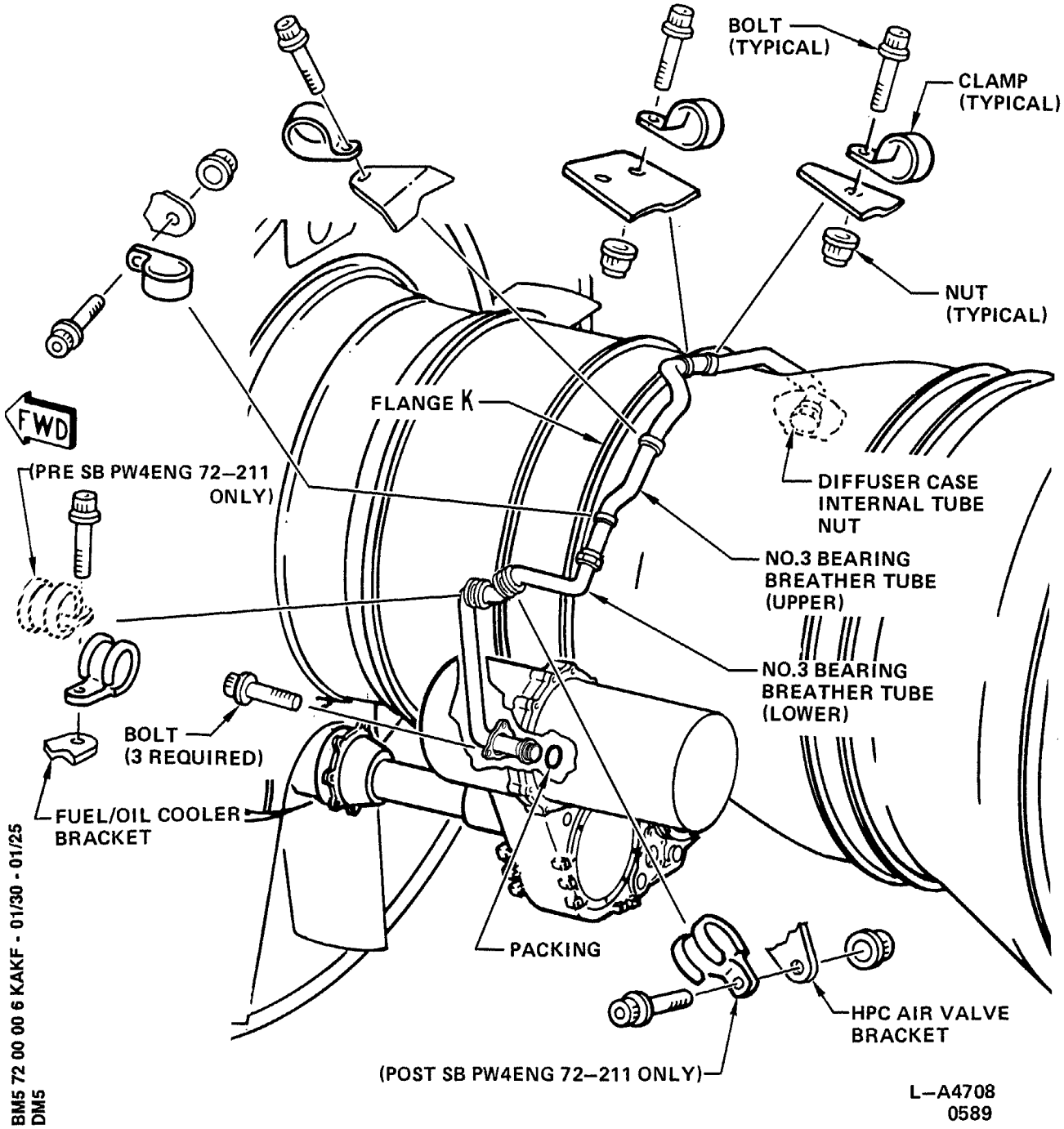
6 (Post SB PW4ENG 79-75) If you do not find coke in the hose and manifold assembly, install the (LR04) hose and manifold assembly as follows : (Ref. Fig. 663) (Sheets 7/10 thru 9/10).

- Install packing lubricated with Material No.P03-001, to the packing groove at the flanged end of the hose and manifold assembly.
- Lubricate threads on manifold elbow with Material No.P03-001. Install the hose and manifold assembly to the diffuser case internal tube nut at approximately 6 o'clock position, and the hose and manifold assembly to port on the main oil pump with bracket and bolts, threads lubricated with Material No.P06-054, handtight only
- Install the clamp, bolt, lubricated with Material No.P03-001, and nut that attach the manifold to the oil pump bracket. TORQUE the clamp bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
- TORQUE the bolts securing the manifold flange to the main oil pump to between 62 and 72 lbf.in. (0.70 and 0.81 m.daN).
- Hold the manifold elbow from turning and TORQUE diffuser case internal tube nut to between 650 and 700 lbf.in. (7.34 and 7.90 m.daN). Secure with Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).
- Secure the hose and manifold assembly to the fluid pressure dampener bracket and the fuel injector support bracket with two loop clamps using four nuts and bolts lubricated with Material No.P03-001. TORQUE the bolts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(h)Examine the No. 3 bearing breather tube assemblies for coke (Ref. Fig. 663) (Sheet 10/10)

1 Remove the upper tube.

- Remove the lockwire from the upper and lower tube nuts of the upper tube.
- Disconnect the tube from the diffuser case internal tube nut at approximately 1 o'clock position.



No. 3 Bearing Breather Tube
Removal/Installation (Sheet 10/10)
Figure 663

- Disconnect the tube from the lower tube nut at approximately 10 o'clock position.
- Remove the clamp bolts and nuts that attach the tube to brackets.
- Remove the tube.

2 Remove the lower tube.
- Remove the three bolts that attach the tube to the gearbox deoiler.
- Remove the clamp bolt that attaches the tube to the bracket on the fuel/oil-cooler rear mount.
- Disengage the tube. Discard the packing.

3 Examine in the breather tubes and in the diffuser case internal tube for coke.

4 If you find coke, the No. 3 bearing carbon seals and/or oil nozzle are possibly damaged. Remove and repair the engine.

5 If you do not find coke in the tubes, install the lower tube.
- Lubricate with Material No.P03-001.
  . The packing
  . The threads of all the bolts
- Install a new packing in the groove at the flanged end of the tube.
- Attach the tube to the gearbox pad with three bolts. Tighten the bolts by hand.

Pre SB PW4 ENG 72-211 only
- Attach the clamp to the bracket on the fuel/oil-cooler rear mount with one bolt. TORQUE the :

End Pre SB
Post SB PW4 ENG 72-211 only
- Attach the clamp to the bracket on the HPC secondary flow control air valve with one bolt. TORQUE the :

End SB
  . Clamp bolt to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).
  . Other bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

6 If you do not find coke in the tubes, install the upper tube.
- Lubricate with Material No.P06-054.
  . The threads of the lower tube nut
- Lubricate with Material No.P03-001.
  . The threads of the tube nut (internal tube of the diffuser case).
- Install the tube to the tube nuts. Tighten the tube nuts by hand.
- Attach the clamps to the brackets with bolts and nuts.
- TORQUE the :
  . Clamp bolt to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).
  . Tube nut (internal tube of the diffuser case) to between 650 and 700 lbf.in. (7.34 and 7.90 m.daN).
  . Tube nut (lower) to between 675 and 750 lbf.in. (7.62 and 8.47 m.daN).
- Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) in the tube nuts.

R (j)If you found no coke :

1 Flush the oil system (Ref. 12-13-79, P. Block 1).

2 Perform test No. 12 (Ref. 71-00-00, P. Block 501).

3 Perform test No. 03 (Ref. 71-00-00, P. Block 501).

4 Examine the color, viscosity, and acidity of the oil after 50 hours of service. If any of these properties is not correct, remove the engine and do the "Inspections for very high Temperature".

D. Inspections for Very High Temperature
(1)Disassemble the engine to get access to all the main and accessory drive bearings, seals, and nozzles.
(2)Examine all the main bearings, seals, seal seats and nozzles.
(3)Examine all the accessory drive bearings, seals, seals seats, and nozzles.
(4)Repair or replace any damaged parts.

14.Inspect Oil System for Contamination

A. Equipment and Materials

ITEM	DESIGNATION
(1)PWA86018	Adapter, Oil Sampler
(2)Material No.P11-027	Cleaning Agents (Ref. 70-00-00)
Referenced Procedures	
- 79-21-03, P. Block 401	Oil Filter
- 79-22-03, P. Block 401	Magnetic Chip Collectors
- 79-22-03, P. Block 601	Magnetic Chip Collectors
- 79-21-10, P. Block 401	Last Change Strainer Elements
- 72-00-00, P. Block 201	Engine - General
- 12-13-79, P. Block 1	Engines (engine Oil System)
- 72-65-07, P. Block 401	Hydraulic Pump Rear Drive Oil Seal Assembly
- 72-65-08, P. Block 401	Hydraulic Pump Front Drive Oil Seal Assembly

B. Sources of Contamination
(1)There are four primary sources of contamination of the oil system :
(a)Unwanted material that is in the engine from the time of its assembly (called build debris) and pieces of a repair.
1 This includes pieces of gasket or packing, sealing compound, pieces of metal, etc.
2 Theses pieces are frequently non-metallic.
3 If metallic, these pieces are frequently larger than the particles that come from a bearing or gear.
(b)Metal particles from a bearing or gear.
1 This contamination is important.
2 You must find the source and correct the problem before the engine goes back in service.
(c)Hydraulic fluid (e.g. skydrol)
CAUTION : HIGH TEMPERATURES CAN CAUSE OIL TO BECOME BLACK. IF HIGH TEMPERATURES ARE A POSSIBLE CAUSE OF BLACK OIL (REF. TSM).
1 This contamination is important.
2 Oil that has hydraulic fluid in it, is black, thick, and gummy. This oil causes a blockage of jets, nozzles, and small-mesh screens.

3 Oil that has hydraulic fluid in it, can cause damage to packings. The quantity of damage depends on the quantity, temperature and length of time of contamination. If packings are damaged, leaks and corrosion of oil system parts is possible.

4 Hydraulic fluid can get into the oil system if :
- There was a failure of a hydraulic pump.
- Someone put hydraulic fluid in the oil tank in error.

(d)Jet fuel

1 This contamination is important.

2 If oil has fuel in it, you can smell the fuel. Also, the viscosity of oil that has fuel in it is less than for oil that does not have fuel contamination. Engine symptoms are high oil temperature and overservicing of (too much oil in) the oil tank.

3 Oil that has fuel in it causes damage to packings. Damaged packings cause oil leaks in the gearbox accessory seals. Depending on the quantity and length of time of the fuel contamination, damage to the bearings is possible.

4 It is possible that an internal leak in the fuel-oil cooler is the cause of fuel contamination.

C. Inspection for Contamination from Solids (Build Debris, Pieces from a Repair, Bearing, or Gear)

(1)Do the inspections that follow :

(a)Do an inspection of the magnetic probes (Ref 79-22-03, P. Block 601) (Ref. Fig. 664, 665)

NOTE : You must keep to a minimum the quantity of times that the main oil filter delta-P warning light comes on. Do the inspection/ replacement of the main oil filter at the recommended times.

(b)If not done during the inspection of the magnetic probes, examine the main oil filter for contamination as follows.

1 Remove the main oil filter (Ref. 79-21-03, P. Block 401).

2 Flush the filter with Material No.P11-027.

3 Strain the solvent through filter paper or a clean cloth. Keep any contamination you find for analysis.

4 Identify the contamination (Ref. 79-22-03, P. Block 601).

5 Install a new main oil filter (Ref. 79-21-03, P. Block 401).

(c)Examine the last chance oil strainer for contamination.

1 Remove all the last chance oil strainers (Ref. 79-21-10, P. Block 401).

2 Examine and clean the strainer elements (Ref. 72-00-00, P. Block 201). Keep any contamination that you find for analysis.

3 Install the last chance oil strainers (Ref. 79-21-10, P. Block 401).

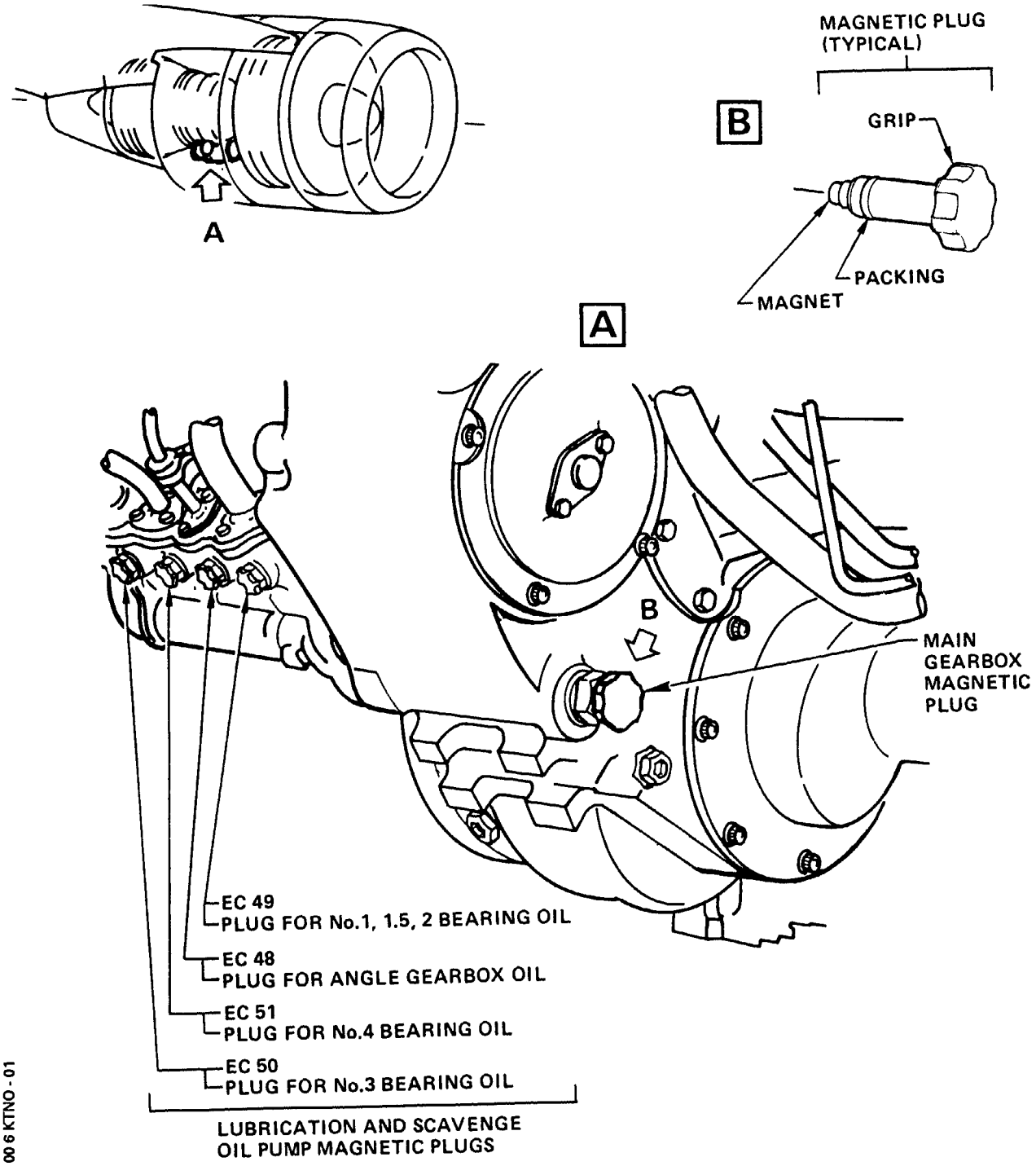
(d)If you find no contamination, you can put the engine back in service.

(2)Identify the contamination. If necessary (Ref. 79-22-03, P. Block 601) for spectroscopic analysis.

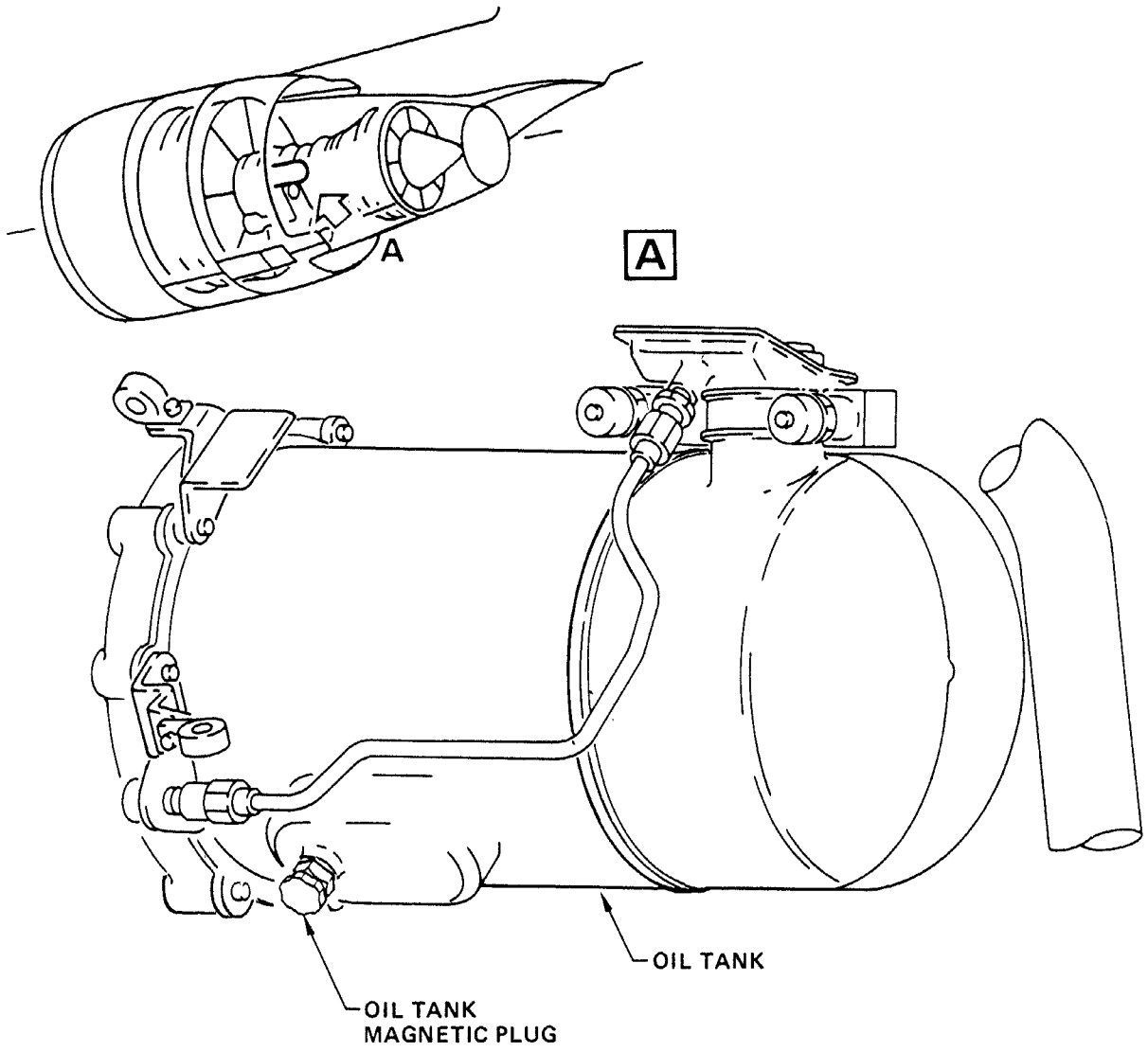
(a)If the particles are from the bearings or gears, you must correct the problem before you can use the engine.

(b)If the particles/pieces are not from the bearings or gears (that is, if they are pieces from a repair, etc.), do as follows.

1 Flush the engine oil system (Ref. 12-13-79, P. Block 1).



Location of Magnetic Plugs on Main Gearbox
Figure 664



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Location of Magnetic Plugs on Oil Tank
Figure 665

R 2 Obey the safety and operating precautions as described in Paragraph 2. (Ref. 71-00-00, P. Block 501).
R 3 Make sure that the wheel chocks CHOCK-MLG, ENGINE RUN-UP (98F10103500000) are in position in front of each forward MLG wheel.
R 4 There must be two qualified persons in the cockpit when performing an engine run above idle. One must monitor the outside and the aircraft behaviour while the other performs the engine test.
R 5 If the aircraft begins to move while performing an engine run, immediately set all the thrust levers to idle position.
R 6 Operate the engine at idle until the temperature of the oil is more than 150°F (65.6°C). (Ref. 71-00-00, P. Block 201). "Engine Starting Procedures (Normal)".
R 7 Accelerate from idle to 1.35 - 1.40 EPR, then go back to idle. Do this five times.
R 8 Operate the engine at 1.35 - 1.40 EPR for 10 minutes.
R 9 Shut down the engine (Ref. 71-00-00, P. Block 201), "Engine Shutdown Procedure" (Normal).
R 10 Examine the main oil filter and magnetic probes for contamination. Refer to Paragraphs C.(1)(a) and (b).
a If there is no contamination, continue to use the engine. Do a magnetic probe inspection at 50 hours of service (Ref. 79-22-03, P. Block 601).
b If there is contamination, do the "Inspection for Contamination from Solids" again. If there is still contamination, remove the engine from service. You must find the source of the contamination and correct the problem before you put the engine back in service.
NOTE : It is not necessary to remove the last chance oil strainers.

D. Inspection for Black Oil
NOTE : Dark oil can be an indication of a serious problem or it can be a condition that requires no maintenance action. The dark oil condition "black oil" is the result of some additives in the oil that oxidize as the oil ages. This can cause very fine carbon particulate which darkens the oil without an effect on the properties which lubricate and cool (Total acid number and viscosity are not changed).
(1)If you see dark oil, you can determine if maintenance action is necessary with the steps that follow :
(a)Does the oil have an unusual smell (burnt or equivalent to fuel or hydraulic fluid) ?
(b)Is the oil thick or gummy ?
(c)Did an engine oil overtemperature ever occur ?
(2)If you answer "yes" to any of the above questions, you must do the procedures that follow :
(a)Do the inspection for contamination from hydraulic fluid.
(b)Perform Oil Overtemperature Inspection above.
(3)If you answer "no" to these questions, the engine can continue in service.

E. Inspection for Contamination from Hydraulic Fluid
CAUTION : HIGH TEMPERATURES CAN CAUSE OIL TO BECOME BLACK. IF HIGH

TEMPERATURES ARE A POSSIBLE CAUSE OF BLACK OIL, REFER TO THE TROUBLE SHOOTING MANUAL.

(1)Do an inspection for contamination from hydraulic fluid if one or more of the items that follows is true.
  (a)There was failure of a hydraulic pump, and it is possible that hydraulic fluid went in the gearbox drain.
  (b)There is corrosion of metal adjacent to the gearbox in the cavity of the hydraulic pump drive pad.
  (c)There is hydraulic fluid in the cavity of the hydraulic pump drive pad.
  (d)The engine oil is black, thick and gummy.
(2)The inspection for contamination from hydraulic fluid is as follows.
  (a)Examine the viscosity of the oil. Refer to Service Bulletin 238 for oil quality limits.
    1 Compare the oil that you think is dirty with oil of the same brand that you know is good.
    2 A large difference in viscosity is an indication of contamination by either jet fuel or hydraulic fluid.
  (b)Do a check of the phosphorus content of the oil. This is the best check of hydraulic fluid contamination. Use either the wet chemical test (ASTM D-1091-64) or spectroscopic oil analysis.
    1 Compare the oil that you think is dirty with oil of the same brand that you know is good.
    2 A large difference in the results of the test is an indication of contamination by hydraulic fluid.
(3)If the inspection of the oil shows that there is contamination from hydraulic fluid or if you think a hydraulic pump is damaged, repair the damaged engine parts as follows.
  (a)Remove the hydraulic pump(s) that failed.
  (b)Remove the fluid from the cavity in the drive pad.
  (c)Remove the carbon seal from the hydraulic pump drive pad (Ref. 72-65-07, P. Block 401 or Ref. 72-65-08, P. Block 401).
    1 Examine the seal and the packing for deterioration. Replace them if necessary.
    2 Examine the driveshaft bearing support and bearings.
      a Try to move the driveshaft axially and radially.
      b If the driveshaft is loose, remove the bearing. Examine the bearing for damage. If damaged, you must replace the bearing.
  (d)Install or, if damaged, replace the carbon seal (Ref. 72-65-07, P. Block 401 or Ref. 72-65-08, P. Block 401).
  (e)Install or, if damaged, replace the hydraulic pump.
  (f)Do the "Procedure to Put the Oil System Back to a Serviceable Condition".

F. Inspection for Contamination from Jet Fuel
(1)When to do an inspection for contamination from jet fuel :
  (a)If you smell jet fuel in the oil.
  (b)If there was overservicing of (too much oil in) the oil tank.
  (c)If there is an indication of high oil temperature.
(2)The inspection for contamination from jet fuel is as follows.
  (a)Examine the viscosity of the oil. Refer to Service Bulletin 238 for oil quality limits.

1 Compare the oil that you think is dirty with oil of the same brand that you know is good.
2 A large difference in viscosity is an indication of contamination by either jet fuel or hydraulic fluid.

(b) Do a check of the phosphorus content of the oil to know if the contamination is from hydraulic fluid or jet fuel. Use either the wet chemical test (ASTM D-1091-64) or spectroscopic oil analysis.
1 Compare the oil that you think is dirty with oil of the same brand that you know is good.
2 A large difference in the results of the tests is an indication of contamination by hydraulic fluid, not jet fuel.

(3) If there is jet fuel contamination, do as follows.
(a) Remove the fuel/oil cooler (Ref. 79-21-05, P. Block 401).
(b) Do an inspection of the fuel/oil cooler. Repair or replace the component as necessary.
(c) Do the "Procedure to Put the Oil System Back to a Serviceable Condition".

G. Procedure to Put the Oil System Back to a Serviceable Condition

(1) Flush the engine oil system (Ref. 12-13-79, P. Block 1).
R (2) Obey the safety and operating precautions as described in Paragraph 2.
R (Ref. 71-00-00, P. Block 501).
R (3) Make sure that the wheel chocks CHOCK-MLG, ENGINE RUN-UP (98F10103500000)
R are in position in front of each forward MLG wheel.
R (4) There must be two qualified persons in the cockpit when performing an
R engine run above idle. One must monitor the outside and the aircraft
R behaviour while the other performs the engine test.
R (5) If the aircraft begins to move while performing an engine run,
R immediately set all the thrust levers to idle position.
R (6) Start the engine (Ref. 71-00-00, P. Block 201) "Engine Starting Procedures (Normal)".
R (7) Operate the engine at idle until the temperature of the oil is more than 150°F (65.6°C).
R (8) Accelerate from idle to 1.35 - 1.40 EPR and go back to idle, five times.
R (9) Operate the engine at 1.35 - 1.40 EPR for 10 minutes.
R (10) Shut down the engine (Ref. 71-00-00, P. Block 201). "Engine Shutdown Procedure" (Normal).
R (11) Get a sample of oil as follows.
(a) Remove the magnetic probe that is in the oil tank (Ref. 79-22-03, P. Block 401).
(b) Install PWA 86018 Adapter in the valve of the magnetic chip collector assembly.
(c) Get a sample of oil.
(d) Make an analysis of the oil. Refer to Paragraph E.(2) or F.(2).
(e) You can use the engine while you make the analysis for contamination.
(f) If the sample of oil shows contamination, do Paragraphs E. or F. and Paragraph G. again.

15. Engine Inspection Following Overtemperature

A. Job Set-Up

(1)Open, safety and tag appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Visual Inspection

(1)Visually check exhaust duct, plug and rear of front compressor drive turbine for burning, distortion, metal particles, or evidence of upstream blade and/or vane distress. If acceptable, continue-in-service after cause of overtemperature has been found and corrected.

C. Hot Section Inspection

(1)Igniter plug high tension leads

(a)If engine was rapidly shut down per the emergency shutdown procedure, the high tension leads must be inspected, particularly at igniter plug terminal, to assure that excessive temperatures did not affect lead insulator.

NOTE : Heat dissipation through igniter plug and high tension lead, caused by a lack of sufficient cooling air during rapid shutdown, can cause deterioration of rubber insulation and result in arcing at terminal area.

(2)Combustion liner

(a)Using chamberscope, or equivalent, check for signs of cracks, burning, overheating, erosion, distortion, combustion liner shift (movement), pin wear, wear at nozzle and mounts.

(3)Check fuel nozzles, using same borescope holes as in step C. (2).

(a)Check for carbon deposits, cracks, distortion, wear, rupture, and burn through.

(4)Check 1st stage nozzle guide vanes, using same borescope holes as in step C. (2).

(a)Check for cracks, FOD, erosion, corrosion, burning excessive bow.

(5)Check 1st stage turbine blades and vanes.

(a)Check for cracks, FOD, tip rub, erosion, corrosion. Discoloration in form of bullseye on airfoil.

(6)Borescope 2nd stage turbine blades.

(a)Examine each blade individually for cracks or evidence of obvious growth such as localized thinning of airfoil in mid-span region, tip rub, erosion and FOD.

(7)Borescope 3rd stage turbine blades and vanes.

(a)Check for cracks, FOD, tip rub and erosion.

(b)If there has been a sudden increase in EGT, check for a possible missing or liberated LPT 3rd stage outer transition duct segment. No missing or liberated outer transition duct segments are permitted.

(8)Determine and correct the cause of the overtemperature.

D. Engine Removal/Repair Following Overtemperature Condition

(1)If applicable, determine and correct the cause of the overtemperature.

(2)When engine has been subjected to overtemperature condition which necessitates engine removal or repair, tag the engine or the build group being replaced indicating maximum temperature reached, duration, cause of the overtemperature, whether overtemperature occurred under steady state or surge conditions, and other pertinent information.

(3)Referring to the applicable sections in the engine manual, accomplish

hot section repair as required to restore engine to serviceable condition. This should include removal and disassembly of the high pressure turbine rotors to permit metallurgical analysis of a 1st and 2nd stage turbine blade and other appropriate inspections, to ensure that all parts conform to requirements.

(4)Disassembly of diffuser and combustor group and low pressure turbine assembly is not necessary unless distress is evident or suspected. However, visual and borescope inspections should be performed in these areas and in high and low pressure compressor groups to ensure entire engine gaspath is free of damage.

E. Close-Up

(1)Close fan and thrust reverser cowl doors (Ref. 79-13-00, P. Block 301). Remove Safety clips and tags and close circuit breakers.

16.Engine Inspection Following Overspeed (Ref. Fig. 666)

A. Job Set-Up

(1)Open, safety and tag appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. No maintenance action is required if ; N1 is operating below 4012 rpm (111.4 percent N1) and N2 is operating below 10300 rpm (104 percent N2).

C. If N1 speed exceeds 4012 rpm (111.4 percent N1) but does not exceed 4070 rpm (113 percent N1) perform following inspection procedure.

(1)Visually inspect inlet and exhaust duct for debris.

(2)Check rotors for freedom of rotation.

(3)Check engine speed indicating system for faults.

(a)If inspection does not reveal any damage, continue engine in service after cause of overspeed is corrected and test run indicates normal operation.

(b)If damage is evident, further inspection should be performed including gaspath borescope inspection as required and appropriate corrective action taken (Ref. 72-00-00, P. Block 601).

D. If N1 speed exceeds 4070 rpm (113 percent N1) but does not exceed 4140 rpm (115 percent N1) perform following inspection procedure.

(1)Perform inspection procedures specified in Paragraph C.

(2)Engine may remain in service for 60 hours after performing inspection specified above.

E. If N1 speed exceeds 4140 rpm (115 percent N1), engine must be shut down as soon as possible and inspected per following :

NOTE : Before removing an engine because of an overspeed indication, correct operation of the N1 speed indicating system should be verified.

(1)Remove front compressor and fan and perform a complete overhaul inspection of rotating parts.

(2)Inspect low pressure turbine blades for growth and for worn knife-edge seals.

(3)Inspect low pressure turbine disks for growth.

(4)Inspect front compressor drive turbine shaft for growth.
(5)Inspect low pressure turbine disks and blades by fluorescent penetrant method.

F. If N2 speed exceeds 10300 rpm (104 percent N2) but does not exceed 10400 rpm (105 percent N2).
(1)No action is required for a transient overspeed of 5 seconds or less in duration.
(2)Perform following inspection procedure if Step (1) is exceeded.
(a)Visually inspect inlet and exhaust duct for debris.
(b)Check rotors for freedom of rotation.
(c)Check engine speed indicating system for faults.
1 If inspection does not reveal any damage, continue engine in service after cause of overspeed is corrected and test run indicates normal operation.
2 If damage is evident, further inspection should be performed including gaspath borescope inspection as required and appropriate corrective action taken. Ref. Para. 4.

G. If N2 speed exceeds 10400 rpm (105 percent N2) but does not exceed 10600 rpm (107 percent N2).
(1)Perform inspection procedure specified in Paragraph D.
(2)Engine may remain in service for 60 hours after performing inspection specified above.

H. If N2 speed exceeds 10600 rpm (107 percent N2). Engine must be shut down as soon as possible and inspected per the following.
NOTE : Before removing an engine because of an overspeed indication, correct operation of the N2 speed indicating system should be verified.
(1)Remove rear compressor and perform a complete overhaul inspection.
(2)Inspect high pressure turbine blades for growth and for worn knife-edge seals.
(3)Inspect high pressure turbine disks for growth.
(4)Inspect high pressure turbine disks and blades by fluorescent penetrant method.

R J. Close-Up
(1)Close fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.

**ON A/C 101-104,

Post SB 72-2032 For A/C 101-104,

16.Engine Inspection Following Overspeed (Ref. Fig. 667)

A. Job Set-Up
(1)Open, safety and tag appropriate circuit breakers and open fan and thrust

reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. No maintenance action is required if ; N1 is operating below 4012 rpm (111.4 percent N1) and N2 is operating below 10450 rpm (105,5 percent N2).

C. If N1 speed exceeds 4012 rpm (111.4 percent N1) but does not exceed 4070 rpm (113 percent N1) perform following inspection procedure.
(1)Visually inspect inlet and exhaust duct for debris.
(2)Check rotors for freedom of rotation.
(3)Check engine speed indicating system for faults.
(a)If inspection does not reveal any damage, continue engine in service after cause of overspeed is corrected and test run indicates normal operation.
(b)If damage is evident, further inspection should be performed including gaspath borescope inspection as required and appropriate corrective action taken (Ref. 72-00-00, P. Block 601).

D. If N1 speed exceeds 4070 rpm (113 percent N1) but does not exceed 4140 rpm (115 percent N1) perform following inspection procedure.
(1)Perform inspection procedures specified in Paragraph C.
(2)Engine may remain in service for 60 hours after performing inspection specified above.

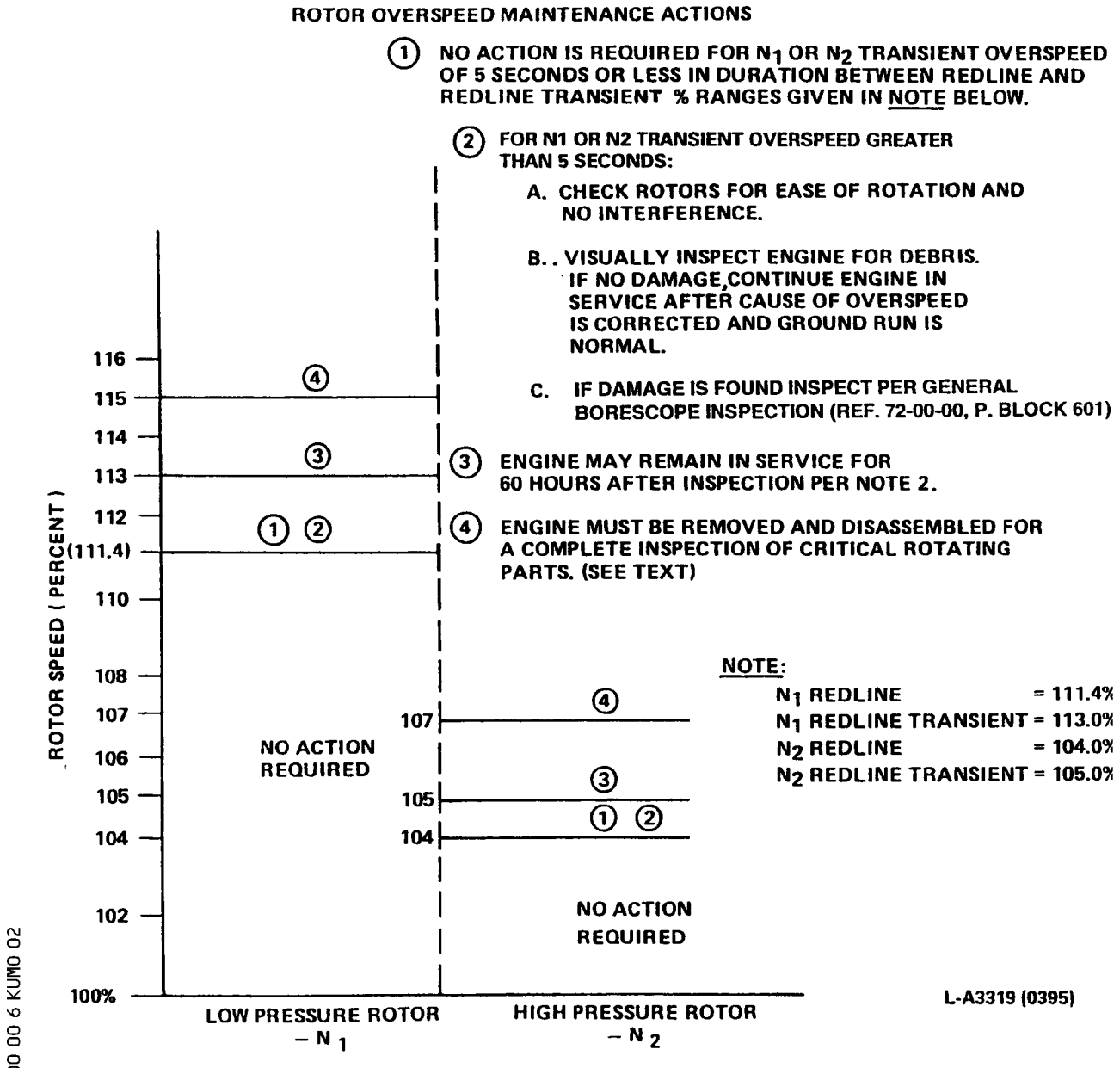
E. If N1 speed exceeds 4140 rpm (115 percent N1), engine must be shut down as soon as possible and inspected per following :
NOTE : Before removing an engine because of an overspeed indication, correct operation of the N1 speed indicating system should be verified.
(1)Remove front compressor and fan and perform a complete overhaul inspection of rotating parts.
(2)Inspect low pressure turbine blades for growth and for worn knife-edge seals.
(3)Inspect low pressure turbine disks for growth.
(4)Inspect front compressor drive turbine shaft for growth.
(5)Inspect low pressure turbine disks and blades by fluorescent penetrant method.

F. If N2 speed exceeds 10450 rpm (105,5 percent N2) but does not exceed 10525 rpm (106,3 percent N2).
(1)No action is required for a transient overspeed of 5 seconds or less in duration.
(2)Perform following inspection procedure if Step (1) is exceeded.
(a)Visually inspect inlet and exhaust duct for debris.
(b)Check rotors for freedom of rotation.
(c)Check engine speed indicating system for faults.
1 If inpsection does not reveal any damage, continue engine in service after cause of overspeed is corrected and test run indicates normal operation.
2 if damage is evident, further inspection should be performed including gaspath borescope inspection as required and appropriate corrective action taken. Ref. Para. 4.

G. If N2 speed exceeds 10525 rpm (106,3 percent N2) but does not exceed 10600 rpm (107 percent N2).
(1)Perform inspection procedure specified in Paragraph D.
(2)Engine may remain in service for 60 hours after performing inspection specified above.

H. If N2 speed exceeds 10600 rpm (107 percent N2). Engine must be shut down as soon as possible and inspected per the following.
NOTE : Before removing an engine because of an overspeed indication, correct operation of the N2 speed indicating system should be verified.
(1)Remove rear compressor and perform a complete overhaul inspection.
(2)Inspect high pressure turbine blades for growth and for worn knife-edge seals.
(3)Inspect high pressure turbine disks for growth.
(4)Inspect high pressure turbine disks and blades by fluorescent penetrant method.

R J. Close-Up
(1)Close fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.


ROTOR OVERSPEED MAINTENANCE ACTIONS
1 NO ACTION IS REQUIRED FOR N1 OR N2 TRANSIENT OVERSPEED OF 5 SECONDS OR LESS IN DURATION BETWEEN REDLINE AND REDLINE TRANSIENT % RANGES GIVEN IN NOTE BELOW.
2 FOR N1 OR N2 TRANSIENT OVERSPEED GREATER THAN 5 SECONDS:
A. CHECK ROTORS FOR EASE OF ROTATION AND NO INTERFERENCE.
B.. VISUALLY INSPECT ENGINE FOR DEBRIS. IF NO DAMAGE,CONTINUE ENGINE IN SERVICE AFTER CAUSE OF OVERSPEED IS CORRECTED AND GROUND RUN IS NORMAL.
C. IF DAMAGE IS FOUND INSPECT PER GENERAL BORESCOPE INSPECTION (REF. 72-00-00, P. BLOCK 601)
3 ENGINE MAY REMAIN IN SERVICE FOR 60 HOURS AFTER INSPECTION PER NOTE 2.
4 ENGINE MUST BE REMOVED AND DISASSEMBLED FOR A COMPLETE INSPECTION OF CRITICAL ROTATING PARTS. (SEE TEXT)
NOTE:
N1 REDLINE = 111.4%
N1 REDLINE TRANSIENT = 113.0%
N2 REDLINE = 104.0%
N2 REDLINE TRANSIENT = 105.0%
ROTOR SPEED (PERCENT)
116
115
114
113
112
(111.4)
110
108
107
106
105
104
102
100%
NO ACTION REQUIRED
NO ACTION REQUIRED
LOW PRESSURE ROTOR – N1
HIGH PRESSURE ROTOR – N2
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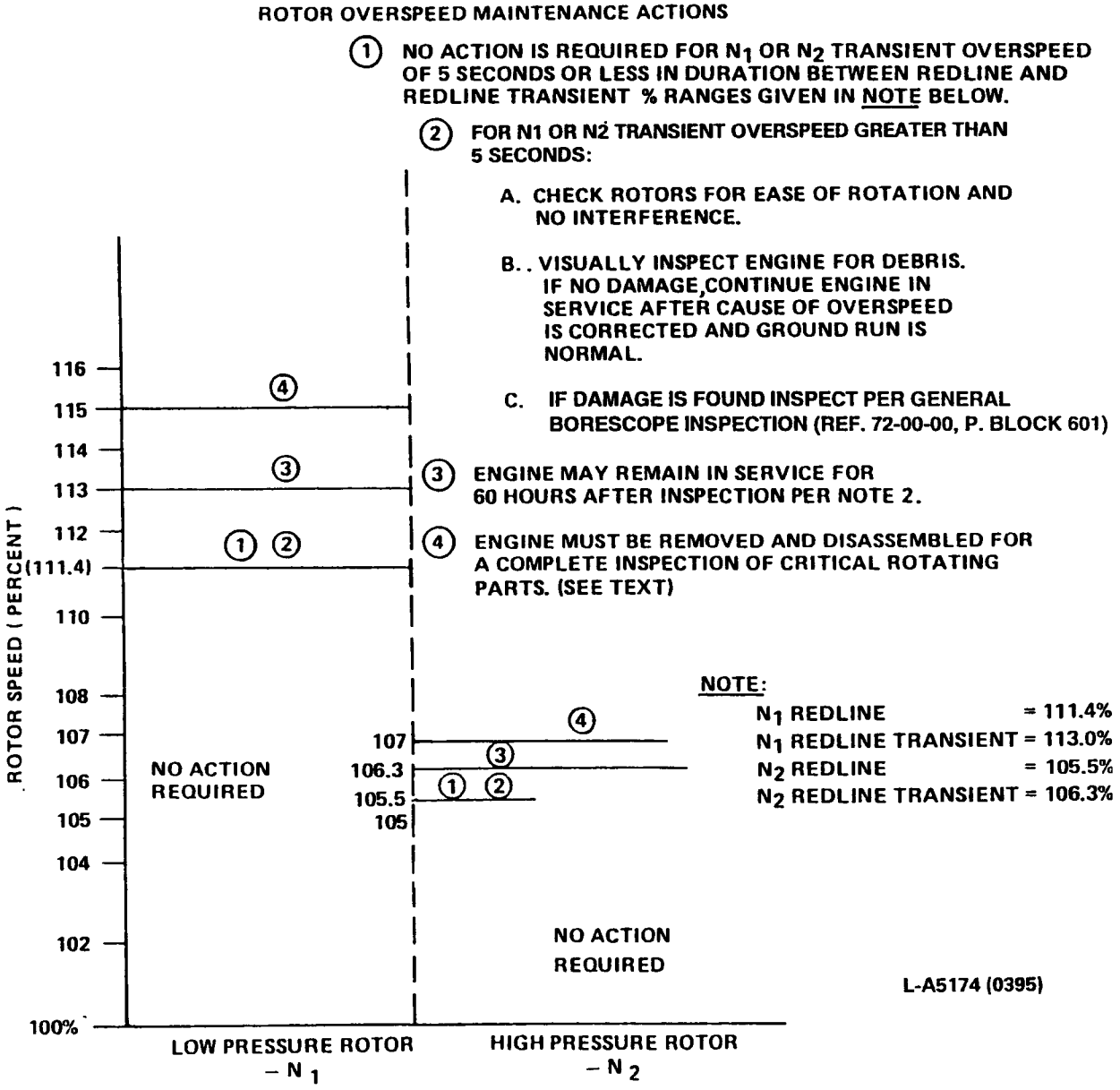
N1 and N2 Rotor Overspeed Maintenance Actions
Figure 666


ROTOR OVERSPEED MAINTENANCE ACTIONS
1 NO ACTION IS REQUIRED FOR N1 OR N2 TRANSIENT OVERSPEED OF 5 SECONDS OR LESS IN DURATION BETWEEN REDLINE AND REDLINE TRANSIENT % RANGES GIVEN IN NOTE BELOW.
2 FOR N1 OR N2 TRANSIENT OVERSPEED GREATER THAN 5 SECONDS:
A. CHECK ROTORS FOR EASE OF ROTATION AND NO INTERFERENCE.
B. . VISUALLY INSPECT ENGINE FOR DEBRIS. IF NO DAMAGE,CONTINUE ENGINE IN SERVICE AFTER CAUSE OF OVERSPEED IS CORRECTED AND GROUND RUN IS NORMAL.
C. IF DAMAGE IS FOUND INSPECT PER GENERAL BORESCOPE INSPECTION (REF. 72-00-00, P. BLOCK 601)
3 ENGINE MAY REMAIN IN SERVICE FOR 60 HOURS AFTER INSPECTION PER NOTE 2.
4 ENGINE MUST BE REMOVED AND DISASSEMBLED FOR A COMPLETE INSPECTION OF CRITICAL ROTATING PARTS. (SEE TEXT)
NOTE:
N1 REDLINE = 111.4%
N1 REDLINE TRANSIENT = 113.0%
N2 REDLINE = 105.5%
N2 REDLINE TRANSIENT = 106.3%
ROTOR SPEED (PERCENT)
116
115
114
113
112
(111.4)
110
108
107
106
105
104
102
100%
107
106.3
105.5
105
NO ACTION REQUIRED
NO ACTION REQUIRED
LOW PRESSURE ROTOR – N1
HIGH PRESSURE ROTOR – N2
L-A5174 (0395)

BM5 72 00 00 6 KUNO 02

N1 and N2 Rotor Overspeed Maintenance Actions
Figure 667

**ON A/C 101-200,

17.Inspect Inlet, Exhaust and Externals

A. Equipment and Materials

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 72-21-02, P. Block 601	First Stage Compressor Rotor (Fan) Blade
- 72-21-03, P. Block 601	Fan Exit Fairing
- 72-21-01, P. Block 601	Inlet Cone
- 72-23-01, P. Block 601	Front Fan Case Assembly
- 72-23-02, P. Block 601	Fan Exit Case and Vane Assembly
- 72-31-02, P. Block 601	First Stage Compressor Stator Assembly
- 72-58-01, P. Block 601	Turbine Exhaust Case Assembly
- 72-23-05, P. Block 401	Fan Exit Liner Segments
- 72-21-05, P. Block 601	Stage 1.6 LPC Blade
- 72-23-06, P. Block 601	Fan Exit (Bifurcation) Fairing
- 72-23-08, P. Block 601	Compressor Intermediate Case Fairing
- 72-52-01, P. Block 601	Stage 6 LPT Blade

B. Job Set-Up
(1)Open, safety and tag appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure
(1)Examine the inlet areas of the engine (Ref. Fig. 668).

Inspection Of The Inlet
Table 610

FIGURE ITEM No.	EXAMINE THE :	IF THERE IS DAMAGE, DO INSPECTION/CHECK
1	Inlet Cone For : Cracks Dents Cuts Delamination	72-21-01
2	Stage 1 LPC (Fan) Blade For : Foreign Object Damage Part Span Shrouds that are not there Part Span Shrouds with Cracks Cracks in Other Areas Tears Sharp Nicks Or Dents	72-21-02

FIGURE ITEM No.	EXAMINE THE :	IF THERE IS DAMAGE, DO INSPECTION/CHECK
	Bends In Tip Or Leading Edge	
3	Rubstrip In The Front Fan Case For : Rubstrip That Is Not There No Bond	72-23-01
4	Fan Exit Fairing For : Foreign Object Damage Cracks Dents Screws That Are Not There	72-21-03
5	Vanes In The Stage 1 LPC Stator For : Foreign Object Damage	72-31-02
6	Stage 1.6 LPC Blades For : Foreign Object Damage (to examine the blades, use fluorescent white light or other applicable tool)	72-21-05
7	Stage 1.6 LPC Blades For : Rubstrip That is Not There	72-21-08
8	Vanes In The Fan Exit Case And Vane For : Cracks Delamination Vanes That Are Not There	72-23-02

(2)Examine the liners and fairings of the intermediate case assembly and fan case (Ref. Fig. 669).
Examine them for :
Loose Parts
Parts That Are Not There
Nicks, Dents, Gouges
Punctures, Holes
Delamination
Cracks
Areas Of Broken Or Fuzzy Stray Fibers
Loose Patches
Examine only fairings (1) and liners (4) and (5) for :

Inspection Of The Liners And Fairings
Table 611

FIGURE ITEM No.	NAME	IF THERE IS DAMAGE, DO INSPECTION/CHECK
1	Fan Exit (Bifurcation) Fairing	72-23-06
2	Compressor Intermediate Case Fairings	72-23-08
3	Fan Exit Liner Segments (Outer)	72-23-05
4	Fan Exit Liner Segments (Inner Rear)	72-23-05
5	Fan Exit Liner Segments (Inner Front)	72-23-05

(3)Examine the exhaust areas of the engine. (Ref. Fig. 670)

Inspection Of The Exhaust Area
Table 612

FIGURE ITEM No.	EXAMINE THE :	IF THERE IS DAMAGE, DO INSPECTION/CHECK OR MAINTENANCE PRACTICES AS REQUIRED
1, 2, 4, 5, 6	Struts, Inner Duct, Outer Duct, Rails, Mount bushings for : Cracks Nicks Dents	72-58-01, P. Block 601
3	Stage 6 LPT Blades For : Tears Cracks Nicks Dents	72-52-01, P. Block 601
4	Outer Duct For : Oil inside and outside bottom of duct	72-58-01, P. Block 201
5	Rails For : Deformation	72-58-01, P. Block 601

FIGURE ITEM No.	EXAMINE THE :	IF THERE IS DAMAGE, DO INSPECTION/CHECK OR MAINTENANCE PRACTICES AS REQUIRED

(4)Examine the tubes, wires, brackets, and clamps. (Ref. Fig. 671)

NOTE : When you do the visual inspection for leaks, it is possible to see a small quantity of remaining oil in the area of the spinner, at the bottom of the fan case, or at the HPC variable vane attach bolts at the bottom of the engine. The source of this oil is either the No. 1 bearing carbon seal assembly or the No. 2 bearing rear carbon seal assembly. After the engine windmills or after a long start procedure (conditions where carbon seal pressure differences are very low, or negative), a small quantity of oil can get through the carbon seals and go to the external part of the engine. This condition is satisfactory and is permitted.
Do not remove the engine for this condition. All other conditions of the inspection must be satisfactory. A limit for the quantity of oil that is permitted is not given. The limits that should be used when you make an estimate of the quantity of oil is oil consumption level.

Inspection Of Externals
Table 613

FIGURE ITEM No.	EXAMINE	SERVICEABLE LIMITS
	All tubes for :	
	cracks	Not Permitted
	erosion	Not Permitted
	interference with other tubes	Not Permitted
	fretting	Not Permitted
	All tube nuts, ferrules for :	
	looseness	Not Permitted
	corrosion	Not Permitted
	All clamps, bolts for :	
	looseness	Not Permitted
	All cables and wires for :	
	damage	Not Permitted
	corrosion	Not Permitted
	All brackets for :	
	cracks	Not Permitted
	damage	Not Permitted

FIGURE ITEM No.	EXAMINE	SERVICEABLE LIMITS
	looseness	Not Permitted
	All lockwire for :	
	looseness	Not Permitted
	breaks	Not Permitted
	(TCC) air shutoff valve (LPT)	

CAUTION : CRACKED OR BROKEN TURBINE COOLING AIR DUCTS CAN DAMAGE THE HIGH PRESSURE TURBINE.

(a)A very careful inspection of the turbine cooling air (TCA) ducts (1) and (4) is very important.

CAUTION : A DEFECTIVE TURBINE CASE COOLING (TTC) SYSTEM CAN STRUCTURALLY DAMAGE THE LOW PRESSURE TURBINE (LPT).

(b)A very careful inspection of the LPT TCC system manifolds (3), valve (5), and cable (2) is very important.

(5)Inspect individual fuel hydraulic external tubes.

(a)Inspect tubes for nicks, chafing, scratches, and pitting.

1 Damage not greater than 0.002 in. (0.051 mm) in depth is acceptable in any location of tube length, including tube bend area.

(b)Inspect tubes for dents.

1 No dents are permitted within 0.250 in. (6.350 mm) of ferrules.

2 Tube dents without sharp edges or corners are acceptable provided tubing internal passage will permit free passage of a ball having an 90 percent diameter of ID of tube. Tubes not meeting this requirement are unacceptable.

(c)Inspect tubes for corrosion (rust) and stain.

1 Corrosion (rust) and stain are acceptable if removable by light polishing with crocus cloth.

(d)Pressure test tubes.

1 Pressure test tubes at 1500 psi (10342.1 kPa).

2 If tube leaks, replace.

(6)Inspect individual oil system external tubes.

(a)Inspect tubes for nicks, chafing, scratches, and pitting.

1 Damage not greater than 0.003 in. (0.076 mm) in depth is acceptable in any location of tube length, including tube bend area.

(b)Inspect tubes for dents.

1 No dents are permitted within 0.250 in. (6.350 mm) of ferrules.

2 Tube dents without sharp edges or corners are acceptable provided tubing internal passage will permit free passage of a ball having an 80 percent diameter of ID of tube. Tubes not meeting this requirement are unacceptable.

(c)Inspect tubes for corrosion (rust) and stain.

1 Corrosion (rust) and stain are acceptable if removable by light polishing with crocus cloth.

(d)Pressure test tubes.

1 Pressure test tubes at 200 psi (1379.0 kPa).

2 if tube leaks, replace.

(7)Inspect individual fuel system external tubes.

(a)Inspect tubes for nicks, chafing, scratches, and pitting.

1 Damage not greater than 0.002 in. (0.051 mm) in depth is acceptable in any location of tube length, including tube bend area.

(b)Inspect tubes for dents.

1 No dents are permitted within 0.250 in. (6.350 mm) of ferrules.

2 Tube dents without sharp edges or corners are acceptable provided tubing internal passage will permit free passage of a ball having an 90 percent diameter of ID of tube. Tubes not meeting this requirement are unacceptable.

(c)Inspect tubes for corrosion (rust) and stain.

1 Corrosion (rust) and stain are acceptable if removable by light polishing with crocus cloth.

(d)Pressure test tubes.

1 Pressure test tubes at 1500 psi (10342.1 kPa).

2 If tube leaks, replace.

(8)Inspect individual air system external tube.

(a)Inspect tubes for nicks, chafing, scratches, and pitting.

1 Damage not greater than 0.003 in. (0.076 mm) in depth is acceptable in any location of tube length, including tube bend area.

(b)Inspect tubes for dents.

1 No dents are permitted within 0.250 in. (6.350 mm) of ferrules.

2 Tube dents without sharp edges or corners are acceptable provided tubing internal passage will permit free passage of a ball having an 80 percent diameter of ID of tube. Tubes not meeting this requirement are unacceptable.

(c)Inspect tubes for corrosion (rust) and stain.

1 Corrosion (rust) and stain are acceptable if removable by light polishing with crocus cloth.

(d)Pressure test tubes.

1 Pressure test tubes at 200 psi (1379.0 kPa).

2 If tube leaks, replace.

NOTE : During visual inspection of oil tubes for condition, security and leakage, very small amount of oil wetness might be observed on variable vane arm retention bolts near the bottom of the engine, or in the nose cone/spinner. The source of this oil has been identified as the No. 2 Bearing Carbon Seal Assembly. It is normal, especially following engine windmilling or an extended start sequence, that a small amount of oil would seep past the No. 2 Bearing Carbon Seal Assembly and then accumulate, after engine shutdown, on the variable vane arm retention bolts. This amount of oil seepage is an acceptable and normal condition and is not cause to remove the engine from service as long as other inspection criteria for oil leaks from engine oil tubes are met.

(9)Inspect variable vane arms for proper attachment or to locate loose or detached vane arms in stages IGV, 5, 6 and 7. Any loose vane arms require that the synchronizing ring for the stage be replaced. However, any detached vane arms that are found require disassembly of the HPC and inspection of rotor disks, blades and vanes. Vane arm detachment is

defined as a loss of rivet pin attachment to the synchronizing ring, incorrect assembly to the vane trunnion or detachment from the vane trunnion (Ref. Fig. 672)

(10) Inspect the variable stator vane actuating system for continue-in-service limits on wear/looseness.
(Ref. Fig. 673)

Continue-In-Service Inspection
Table 614

FIGURE ITEM No.	EXAMINE	DAMAGE LIMITS	DISPOSITION
1	Clevis attachments : lever set connecting rod to VSV unison ring for IGV, 5th, 6th and 7th stages for looseness	No wear/looseness permitted	Replace/Repair within 250 hours
2	Actuator support bracket upper mounting attachments for radial wear/looseness	Maximum wear/ looseness permitted is 0.040 in. (1.016 mm)	Replace/Repair within 250 hours
3	Actuator support bracket lower mounting attachments for radial wear/looseness	Maximum wear/ looseness permitted is 0.050 in. (1.270 mm)	Replace/Repair within 250 hours
4	Lever set assembly for axial wear/looseness	Maximum wear/ looseness permitted is 0.040 in. (1.016 mm)	Replace/Repair within 250 hours
5	Lever set assembly for radial wear looseness	Maximum wear/ looseness permitted is 0.030 in. (0.762 mm)	Replace/Repair within 250 hours

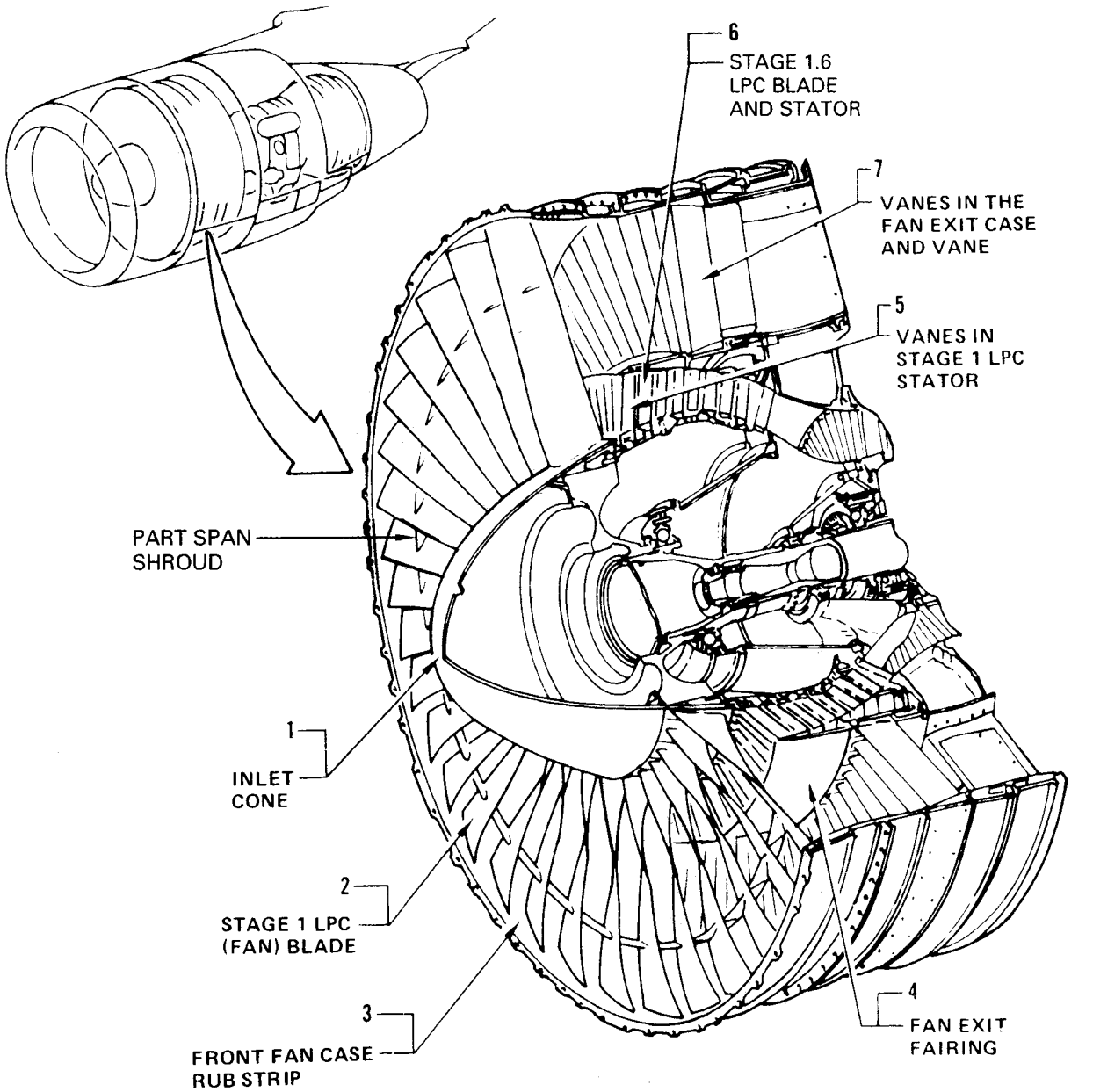
(11) Examine the HPC front case split flange for fractured or missing bolts (Ref. Fig. 674).
(a) If only one bolt or nut on each side is fractured or missing, at any of the (11) eleven positions, the nut or bolt must be replaced within 25 flight cycles.
(b) If more than one bolt or nut is fractured on the same side of the engine, the bolts or nut at the fractured location must be replaced.

(c)If the #11 position bolt is fractured or is missing, that bolt must be replaced. In addition, torque the #10 bolt to 200 lbf. in. (2.26 m.daN) to make sure the #10 bolt is not cracked.

(d)If any bolts or nut are found fractured or missing, you must inspect the synchronizing ring system to find the liberated bolt or nut pieces or bolts or nut to prevent interference with the variable vane system operation. If bolt or nut sections are found to obstruct the operation of the synchronizing rings, the engine must be removed for HPC 5th, 6th and 7th stage blade replacements.

D. Close-Up

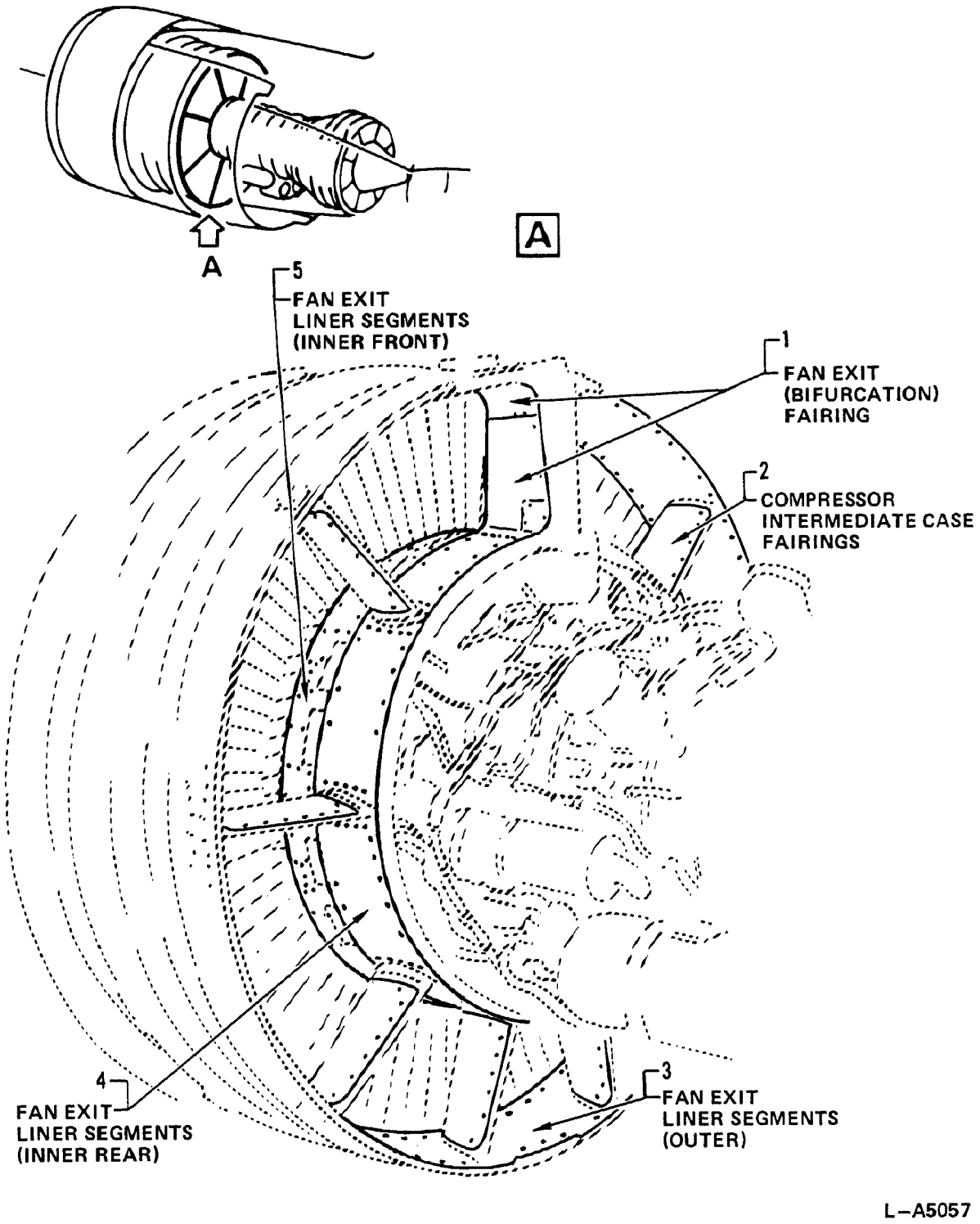
(1)Close fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.



L-A3583 (0696

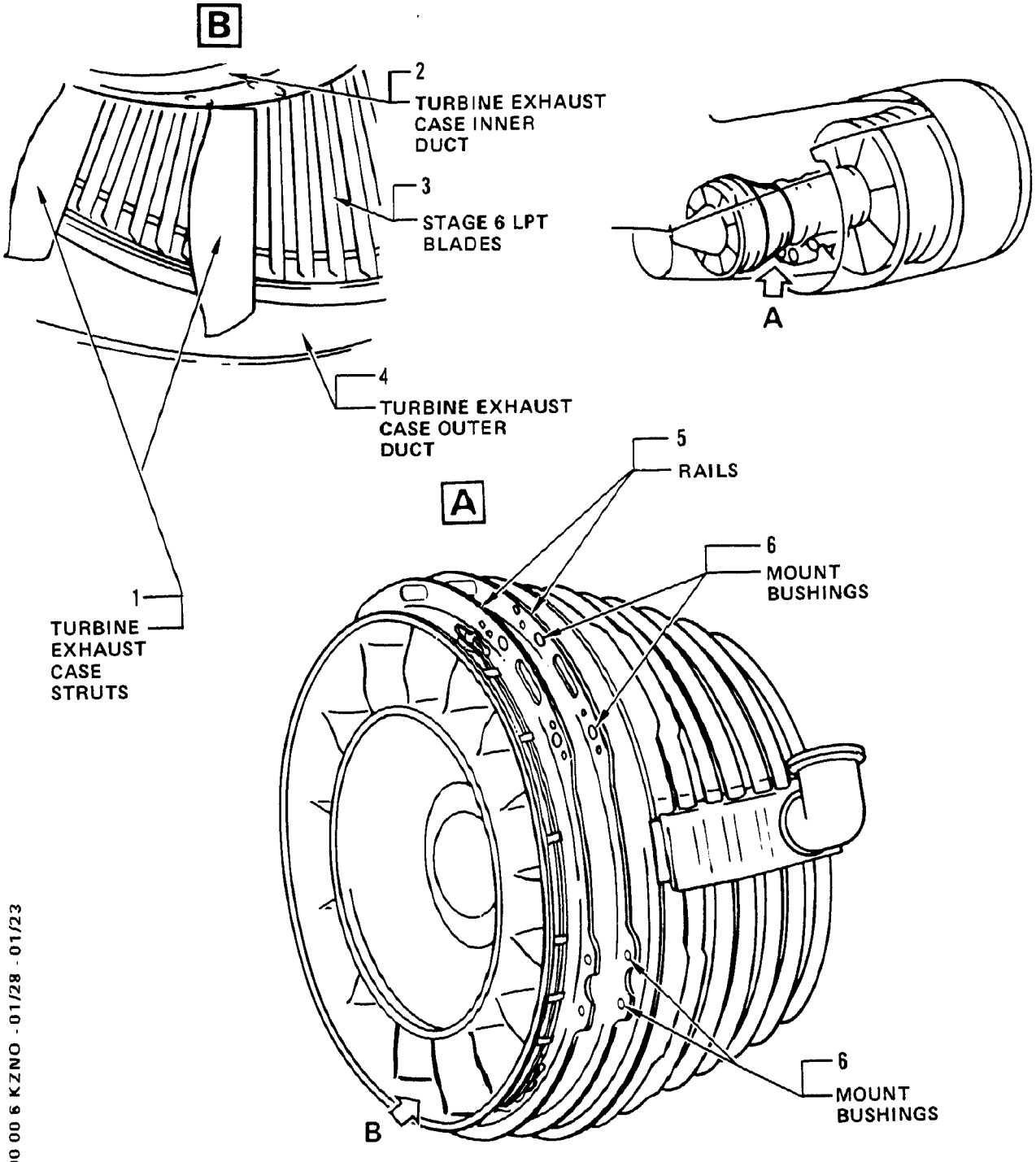
BM5 72 00 00 6 KVN0 02

Inspection of the Inlet
Figure 668



BM5 72 00 00 6 KXNO - 01/28 - 01/23
DM5

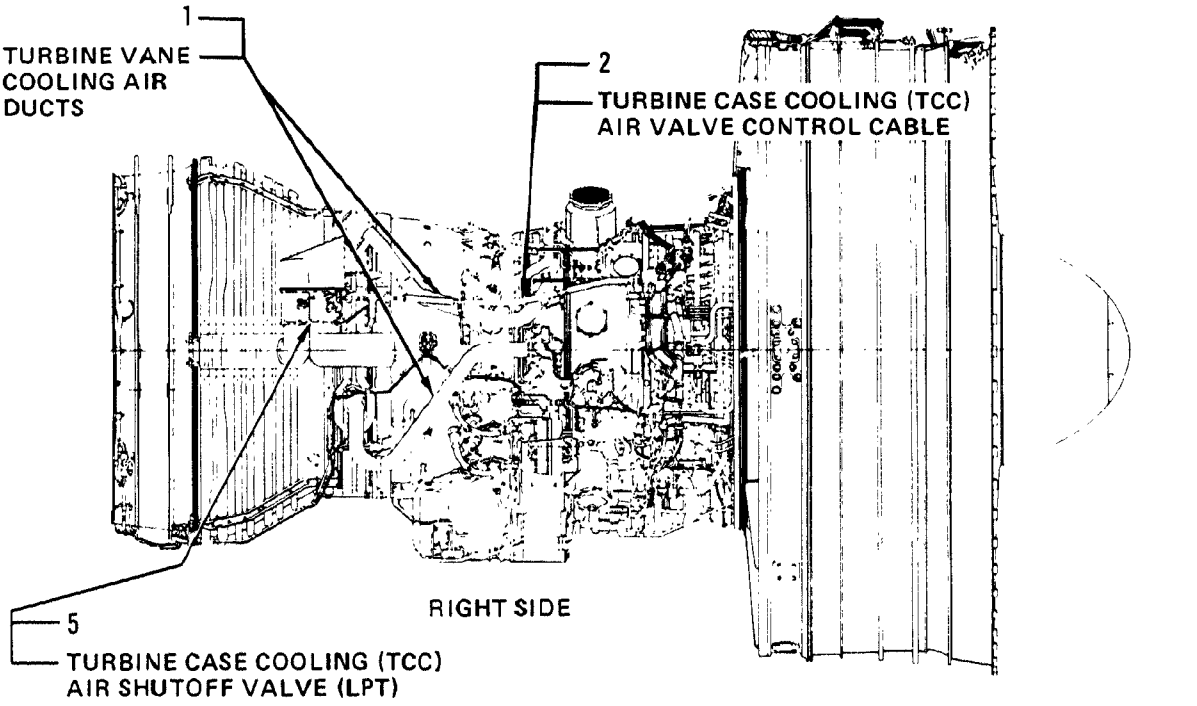
Inspection of the Liners and Fairings
Figure 669



BM5 72 00 00 6 KZNO - 01/28 - 01/23
DM5

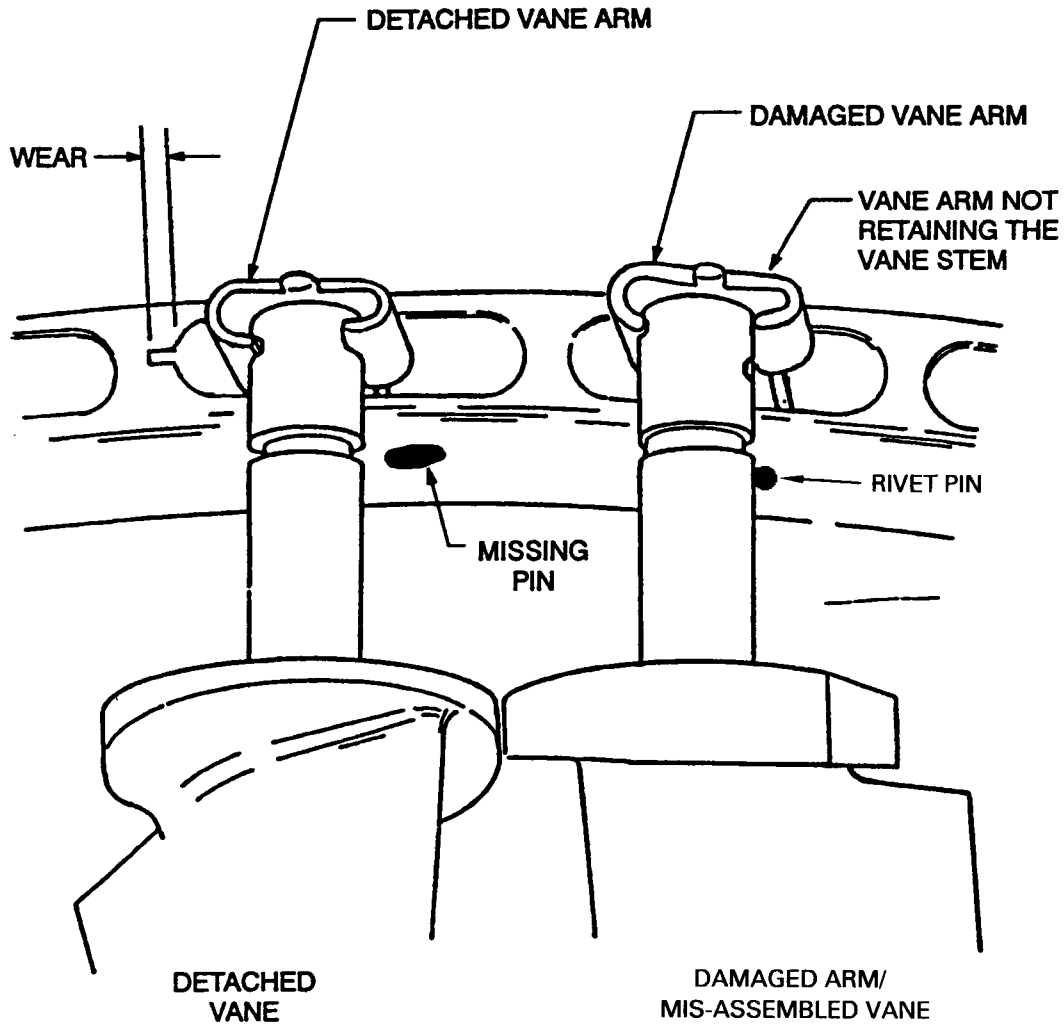
L-A3013
1088

Inspection of the Exhaust Area
Figure 670



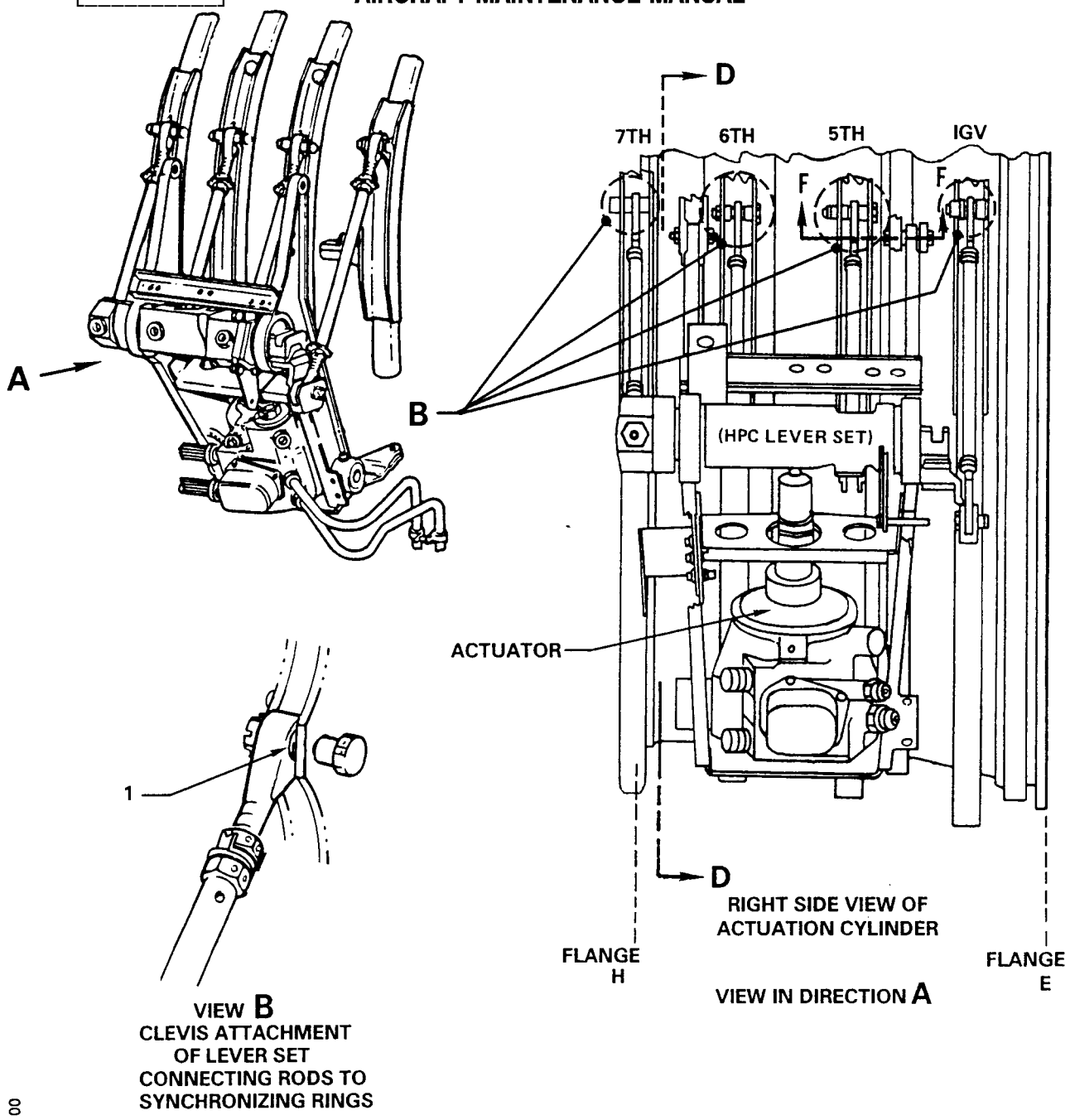
BMS 72 00 00 6 KAPD - 01/28 - 01/23
DM5

Location of TCA and TCC part
Figure 671



BM5 72 00 00 6 KCB0 00

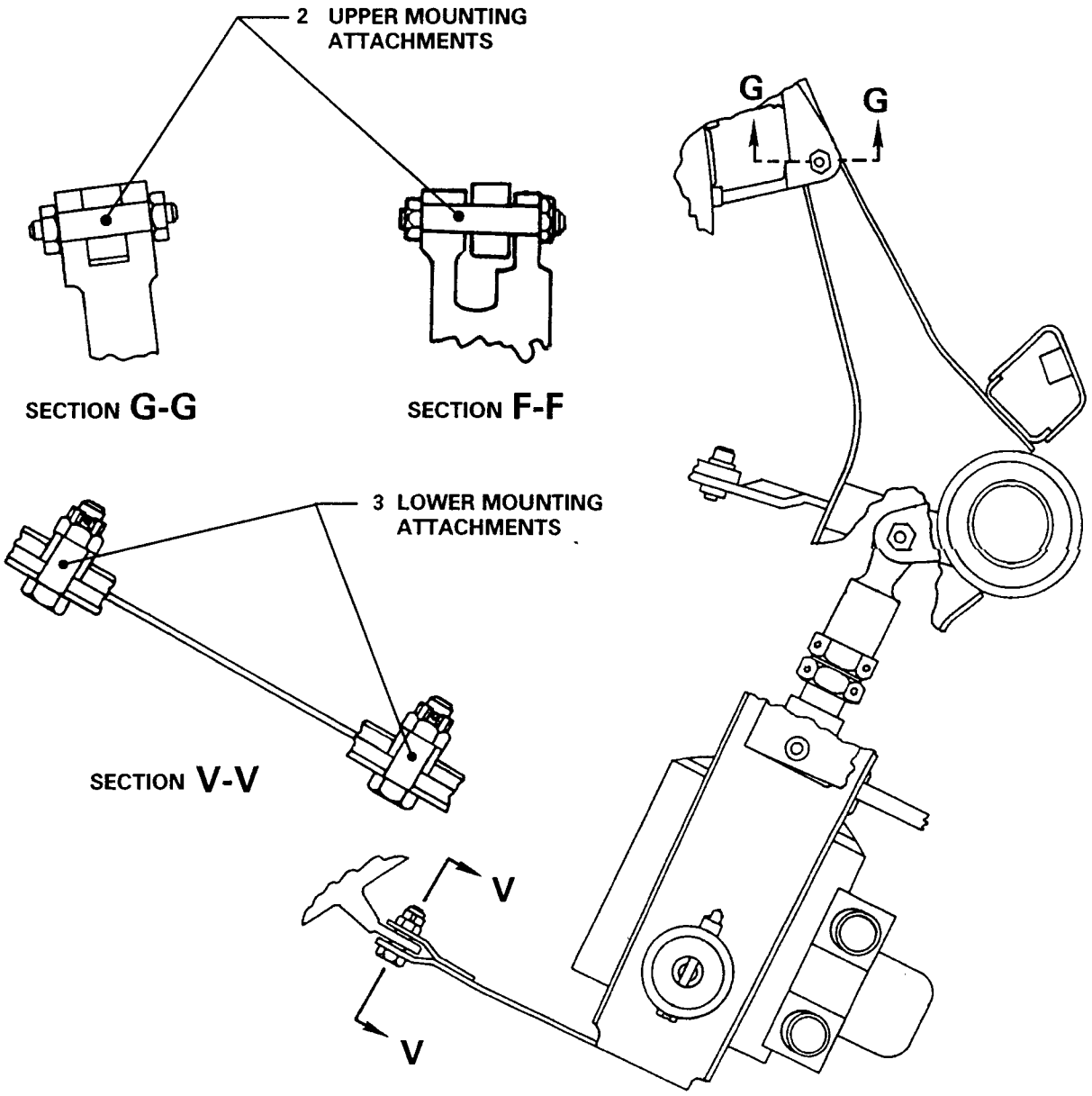
Inspect HPC Variable Vane Arms
Figure 672



L-A8567 (0000)

BM5 72 00 00 6 KAPA - 00

Continue-In-Service Inspection (sheet 1/3)
Figure 673

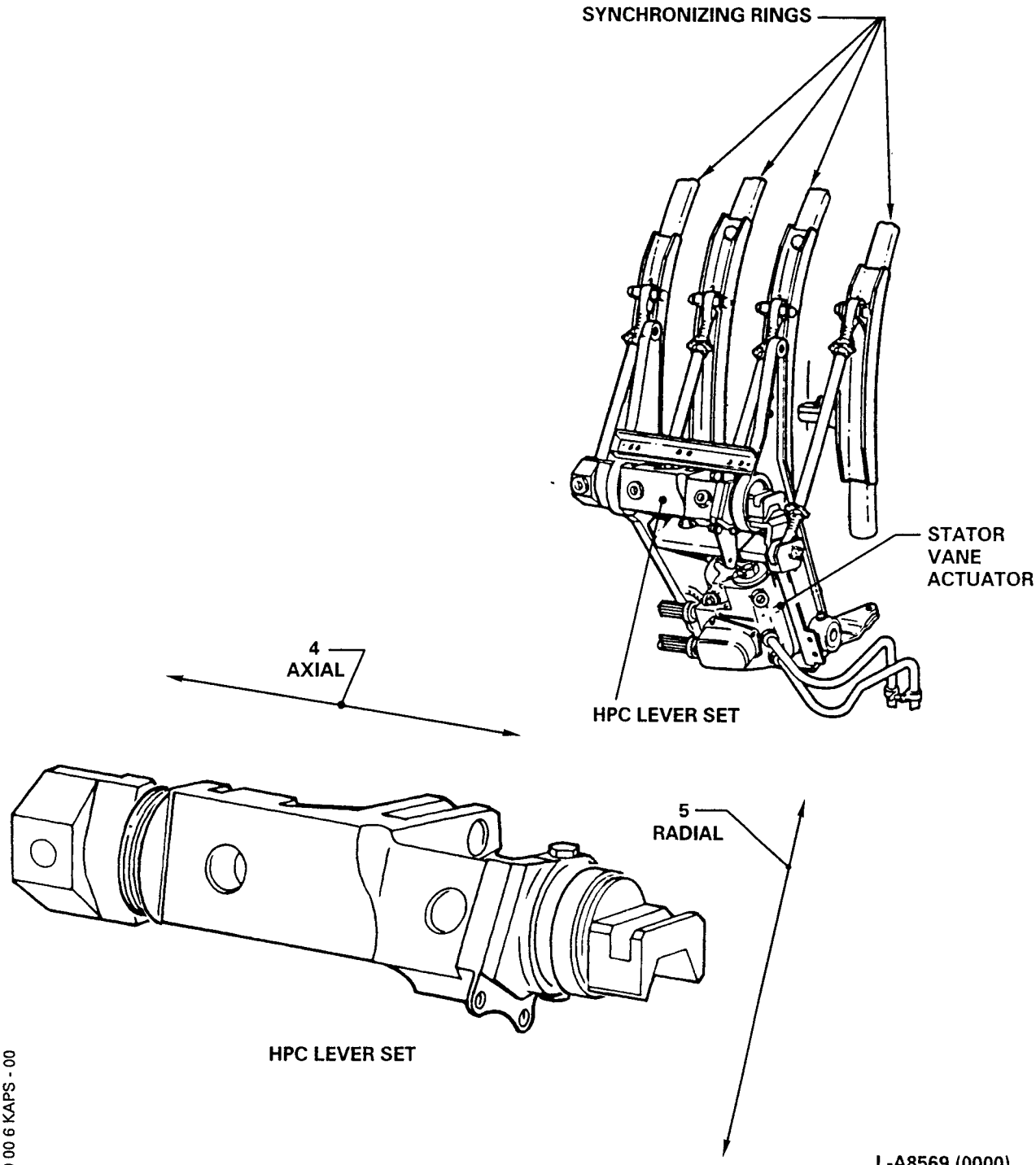


SECTION D-D
(COMPRESSOR STATOR LEVER SET AND ACTUATOR)

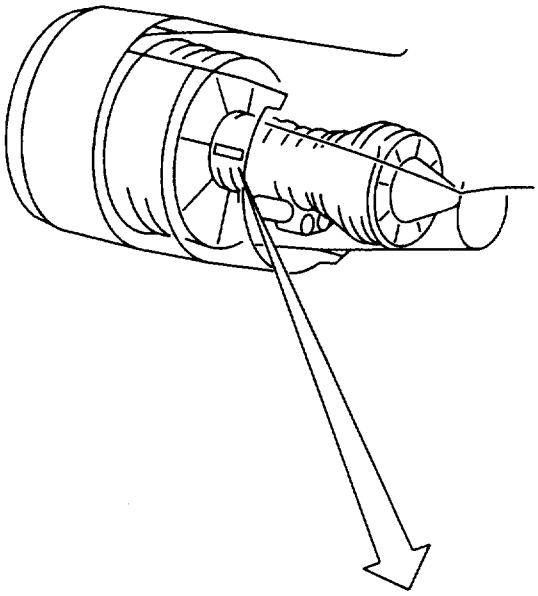
L-A8568
(0000)

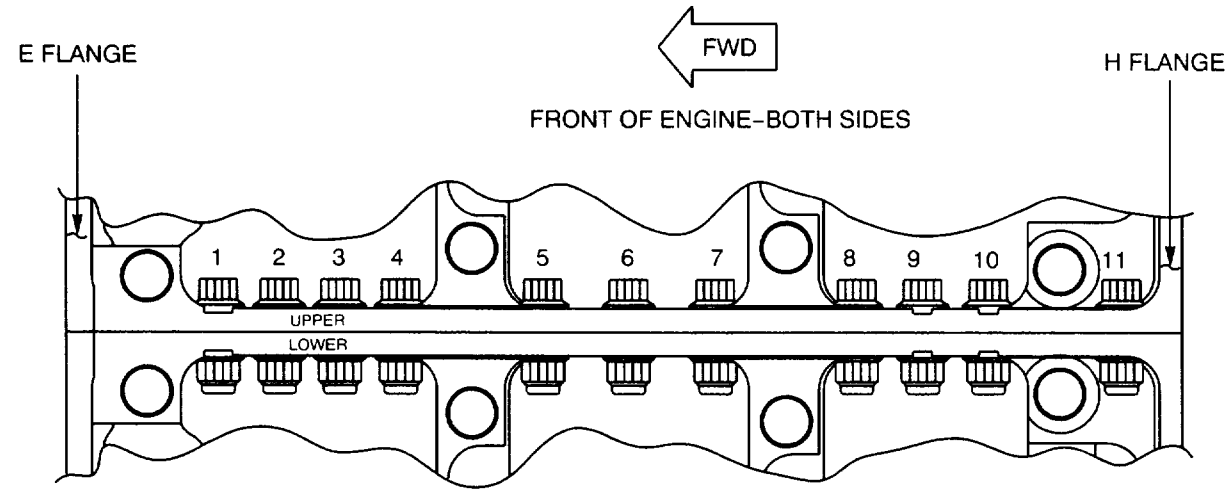
BM5 72 00 00 6 KAPJ - 00

Continue-In-Service Inspection (sheet 2/3)
Figure 673



Continue-In-Service Inspection (sheet 3/3)
Figure 673





BM5 72 00 00 6 KPW0 00

L-B7169 (0299)
PW V

HPC Front Case Split Flange Bolt Inspection
Figure 674

18. Engine Windmilling Inspection

A. Job Set-Up
(1) Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
CAUTION : ENGINE MALFUNCTIONS CAUSING AN IN FLIGHT SHUTDOWN (IFS) MUST BE INVESTIGATED/CORRECTED PRIOR TO ENGINE OPERATION ASSOCIATED WITH THIS INSPECTION PROCEDURE

B. Prior to further operation, engines which have windmilled as result of in flight shutdown (IFS) must be inspected in accordance with the following:
NOTE : Engine operating conditions recorded prior to and after shutdown and during windmilling are required for this inspection and should be retained for future reference.
(1) If there was continuous positive oil pressure following engine shutdown and during windmilling, (an indication pump was producing pressure, i.e., pump did not fail, oil lines did not fracture, or rotor/gearbox did not seize, etc) accomplish the following checks:
NOTE : During windmilling, oil pressure indications may be low or unreadable, (Below 40 PSIG, 2.76 BARS) which is permissible if oil temperature conditions are within limits. (Ref. 71-00-00, P. Block 201).
(a) Remove main oil filter and six magnetic probes, by substeps 1 and 2, and inspect for presence of metal chips.
1 Remove and install main oil filter (Ref. 79-21-03, P. Block 401).
2 Remove and install six magnetic probes (Ref. 79-22-03, P. Block 401). If no chips are found on oil filter or on any of the six probes, reinstall filter and probes. If chips are found on probes or main oil filter, it may be an indication of bearing distress and requires additional investigation prior to further flight. Refer to Paragraph 14.
(b) Service oil system (Ref. 12-13-79, P. Block 001).
(c) Perform engine IDLE ren for five minutes (Ref. 71-00-00, P. Block 201).
(d) Reinspect oil filter and six magnetic probes by step (a).
(e) If no metal chips are found during reinspection engine may be continued-in-service but recheck of oil filter and chip collectors must be accomplished after first flight, 50 hours, and 100 hours of operation.
(2) If engine windmilling was the result of an in flight shutdown (IFS) at power for any of the following conditions the engine must be removed for a complete inspection of all bearing compartments.
(a) Oil pressure reading below 40 psig (2.76 bars).
(b) High oil temperature reading (Ref. 71-00-00, P. Block 201).
(c) Interrupted oil supply for more than 10 seconds.
(d) Engine operated or windmilled without oil (i.e., no oil in system, or oil pump shaft failure).

C. Close-Up
(1) Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301) and remove safety clips and tags and close circuit breakers.

19.Procedures Following Ingestion of High Concentrations of Volcanic Ash Or Sand

A. Equipment and Materials

ITEM	DESIGNATION
(1)PWA86018	Adapter, Oil Sampler
Referenced Procedures	
- 12-13-79, P. Block 1	Engines (Engine Oil System)
- 71-13-00, P. Block 301	Cowl Doors
- 72-00-00, P. Block 601	Engine - General
- 73-12-03, P. Block 401	Filter - Fuel
- 73-13-05, P. Block 401	Strainer - Fuel Distribution Valve
- 75-24-14, P. Block 401	Filter Turbine Vane and Blade Cooling Air Valve
- 75-33-02, P. Block 401	Valve Filter - HPC Secondary Flow Control
- 79-21-03, P. Block 401	Filter - Oil
- 79-21-10, P. Block 401	Strainer Element - Last Change
- 79-22-03, P. Block 401	Magnetic Chip Collectors

B. Job Set-Up

(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure

CAUTION : INGESTION OF HIGH CONCENTRATIONS OF VOLCANIC ASH OR SAND INTO AN ENGINE CAN CAUSE OPERATIONAL PROBLEMS INCLUDING LOSS OF POWER. EVEN IF OPERATIONAL PROBLEMS ARE NOT EXPERIENCED, ASH OR SAND CONTAMINATION OF ENGINE SYSTEMS COULD RESULT IN PROBLEMS SUCH AS PERFORMANCE DETERIORATION, BLOCKED COOLING AIR PASSAGES, AND ABRASIVE DAMAGE. IF ENGINES HAVE BEEN SUBJECTED TO VOLCANIC ASH OR SAND INGESTION, THE FOLLOWING PROCEDURE SHOULD BE COMPLIED WITH.

(1)If engines have experienced operational problems resulting from ash or sand ingestion :

(a)Remove engine(s), disassemble, inspect and repair as necessary, paying particular attention to oil system, air supplied components, turbine cooling passages and fuel system components.

(b)For engines operating under the requirements of Service Bulletin PW4ENG 72-731 to avoid Fan Thrust Deterioration Mode (FTDM), recontour the fan blade leading edges to any of the approved procedures in SB PW4ENG 72-731.

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

19.Procedures Following Ingestion of High Concentrations of Volcanic Ash Or Sand

A. Equipment and Materials

ITEM	DESIGNATION
(1)PWA86018	Adapter, Oil Sampler
Referenced Procedures	
- 12-13-79, P. Block 1	Engines (Engine Oil System)
- 71-13-00, P. Block 301	Cowl Doors
- 72-00-00, P. Block 601	Engine - General
- 73-12-03, P. Block 401	Filter - Fuel
- 73-13-05, P. Block 401	Strainer - Fuel Distribution Valve
- 75-24-14, P. Block 401	Filter Turbine Vane and Blade Cooling Air Valve
- 79-21-03, P. Block 401	Filter - Oil
- 79-21-10, P. Block 401	Strainer Element - Last Change
- 79-22-03, P. Block 401	Magnetic Chip Collectors

B. Job Set-Up

(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure

CAUTION : INGESTION OF HIGH CONCENTRATIONS OF VOLCANIC ASH OR SAND INTO AN ENGINE CAN CAUSE OPERATIONAL PROBLEMS INCLUDING LOSS OF POWER. EVEN IF OPERATIONAL PROBLEMS ARE NOT EXPERIENCED, ASH OR SAND CONTAMINATION OF ENGINE SYSTEMS COULD RESULT IN PROBLEMS SUCH AS PERFORMANCE DETERIORATION, BLOCKED COOLING AIR PASSAGES, AND ABRASIVE DAMAGE. IF ENGINES HAVE BEEN SUBJECTED TO VOLCANIC ASH OR SAND INGESTION, THE FOLLOWING PROCEDURE SHOULD BE COMPLIED WITH.

(1)If engines have experienced operational problems resulting from ash or sand ingestion :

(a)Remove engine(s), disassemble, inspect and repair as necessary, paying particular attention to oil system, air supplied components, turbine cooling passages and fuel system components.

(b)For engines operating under the requirements of Service Bulletin PW4ENG 72-731 to avoid Fan Thrust Deterioration Mode (FTDM), recontour the fan blade leading edges to any of the approved procedures in SB PW4ENG 72-731.

**ON A/C 101-200,

(2)If engines have not experienced operational problems resulting from ash or sand ingestion :

(a)Visually inspect engine inlet and exhaust areas for evidence of damage or excessive erosion (Ref. Para. 1).

(b)Borescope inspect high pressure compressor and high pressure turbine for evidence of following.
For borescope inspection procedures and inspection limits (Ref. Para. 1).

Excessive erosion
Foreign object damage (FOD)
Blockage of high pressure turbine airfoil cooling holes
Build-up of ash deposits.

(c) Do an inspection of the magnetic chip collectors and the oil, as follows.

1 Examine the magnetic probes for contamination (Ref. 79-22-03, P. Block 601).

2 Do a spectroscopic analysis of the oil, as follows :
- With the magnetic probe removed from the oil tank, install PWA 86018 Adapter at that location. Get a sample of oil.
- Do a spectroscopic analysis of the oil to know if there is engine damage (Ref. 79-22-03, P. Block 601).

3 If the oil is not satisfactory, flush the oil system (Ref. 12-13-79, P. Block 1). Then make another analysis of the oil.

(d) Remove, clean, and replace oil, fuel, and air filters. If contamination is found, retain sample for analysis. See substeps (f) through (h) for specific items to be checked.

(e) Oil system
Main oil filter (Ref. 79-21-03, P. Block 401).
No. 1, 1.5 and 2 bearing oil pressure last chance strainer (Ref. 79-21-10, P. Block 401).
No. 3 bearing oil pressure last chance strainer (Ref. 79-21-10, P. Block 401).
No. 4 bearing oil pressure last chance strainer (Ref. 79-21-10, P. Block 401).
Angle and main gearbox last chance strainer (Ref. 79-21-10, P. Block 401).

(f) Fuel system
Fuel pump filter (Ref. 73-12-03, P. Block 401)
NOTE : If fuel filter bypass light indication was noted during last operation or during exposure to high concentrations of sand or volcanic ash contamidents the following additional fuel filters should be checked.
Fuel distribution valve inlet screen (Ref. 73-13-05, P. Block 401).

(g) Air system
Turbine vane and blade cooling air valve filter (Ref. 75-24-14, P. Block 401).

(h) Test engine HPC secondary flow control valve filter (Ref. 75-33-02, P. Block 401).

(j) For engines operating under the requirements of SB PW4ENG 72-731 to avoid FTDM, recontour the fan blade leading edges to any of the approved procedures in SB PW4ENG 72-731 at the next station capable of performing this procedure, not to exceed 10 cycles.

(k) Monitor engine operation to determine if a shift in performance parameters has occurred. If parameters are abnormal, refer to normal trouble shooting procedures.

D. Close-Up

(1) Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301) and remove safety clips and tags and close circuit breakers.

**ON A/C 101-105,

Post SB 71-2024 For A/C 101-105,

(2)If engines have not experienced operational problems resulting from ash or sand ingestion :
(a)Visually inspect engine inlet and exhaust areas for evidence of damage or excessive erosion (Ref. Para. 1).
(b)Borescope inspect high pressure compressor and high pressure turbine for evidence of following.
For borescope inspection procedures and inspection limits (Ref. Para. 1).
Excessive erosion
Foreign object damage (FOD)
Blockage of high pressure turbine airfoil cooling holes
Build-up of ash deposits.
(c)Do an inspection of the magnetic chip collectors and the oil, as follows.
1 Examine the magnetic probes for contamination (Ref. 79-22-03, P. Block 601).
2 Do a spectroscopic analysis of the oil, as follows :
- With the magnetic probe removed from the oil tank, install PWA 86018 Adapter at that location. Get a sample of oil.
- Do a spectroscopic analysis of the oil to know if there is engine damage (Ref. 79-22-03, P. Block 601).
3 If the oil is not satisfactory, flush the oil system (Ref. 12-13-79, P. Block 1). Then make another analysis of the oil.
(d)Remove, clean, and replace oil, fuel, and air filters. If contamination is found, retain sample for analysis. See substeps (f) through (h) for specific items to be checked.
(e)Oil system
Main oil filter (Ref. 79-21-03, P. Block 401).
No. 1, 1.5 and 2 bearing oil pressure last chance strainer (Ref. 79-21-10, P. Block 401).
No. 3 bearing oil pressure last chance strainer (Ref. 79-21-10, P. Block 401).
No. 4 bearing oil pressure last chance strainer (Ref. 79-21-10, P. Block 401).
Angle and main gearbox last chance strainer (Ref. 79-21-10, P. Block 401).
(f)Fuel system
Fuel pump filter (Ref. 73-12-03, P. Block 401)
NOTE : If fuel filter bypass light indication was noted during last operation or during exposure to high concentrations of sand or volcanic ash contamidents the following additional fuel filters should be checked.
Fuel distribution valve inlet screen (Ref. 73-13-05, P. Block 401).
(g)Air system
Turbine vane and blade cooling air valve filter (Ref. 75-24-14,

P. Block 401).

(h)For engines operating under the requirements of SB PW4ENG 72-731 to avoid FTDM, recontour the fan blade leading edges to any of the approved procedures in SB PW4ENG 72-731 at the next station capable of performing this procedure, not to exceed 10 cycles.

(j)Monitor engine operation to determine if a shift in performance parameters has occurred. If parameters are abnormal, refer to normal trouble shooting procedures.

D. Close-Up

(1)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301) and remove safety clips and tags and close circuit breakers.

**ON A/C 101-200,

20.Use of Damaged Engines and Parts

A. Engines and engine parts involved in abnormal operational circumstances require special disposition before a determination can be made as to their continued serviceability.

B. Abnormal operational circumstances are defined as events which fall outside the operating envelope for the engine, aircraft, or engine/aircraft combination as originally certified. These circumstances include such events as :

(1)Accidents
(2)Serious Operational Events
(3)Impacted/Dropped Engines
(4)Tailpipe Fires

C. For detailed instructions regarding disposition of engines and parts involved in abnormal operational circumstances (Ref. 70-00-00, P. Block 201).

21.Birdstrike (Foreign Object Damage) Inspection Requirements

WARNING : THERE IS A POSSIBLE HEALTH RISK TO PERSONNEL WHO DO MAINTENANCE TASKS AFTER A BIRD STRIKE. THE SAFETY MEASURES THAT FOLLOW ARE RECOMMENDED.

R - USE DISPOSABLE GLOVES (MATERIAL No. P05-198).
R - USE A DISPOSABLE COVERALL IF THERE IS A RISK OF CONTACT WITH
R BIRD REMAINS WHEN CLEANING.
R - DO NOT USE PRESSURIZED AIR OR WATER TO CLEAN THE PART OF THE
R ENGINE THAT WAS HIT BY THE BIRD.
- REMOVE THE BIRD REMAINS AND PUT THEM IN A PLASTIC BAG.
- DO NOT TOUCH YOUR FACE, EYES, NOSE, ETC. WITH YOUR GLOVES.
R - REMOVE THE GLOVES AND THE DISPOSABLE COVERALL (IF USED) AND PUT THEM IN THE SAME PLASTIC BAG AS THE REMAINS. SEAL THE BAG.
R - DISCARD THE BAG WITH THE SAME PROCEDURE USED FOR USUAL GARBAGE.
- CAREFULLY WASH YOUR HANDS WITH SOAP AND WATER.

A. In the event of a reported or suspected birdstrike, visually inspect the following for evidence of damage :

NOTE : Evidence of birdstrike may be difficult to detect especially with the passing of time or when weather conditions interfere. Even a small amount of organic material in the inlet is strong evidence of a birdstrike. Bird remains are usually found - on inboard surfaces of aft (concave side) part span shrouds ; at outboard ends of fan exit guide vanes or low pressure compressor inlet guide vanes ;
R at 2.5 bleed screen ; in reverser linkage.
Inspection of inlet area may be guided by pattern of bird remains to determine possibly damaged areas. Fan exit guide vanes, sound absorbing liners and low pressure compressor inlet (including inlet vanes and stage 1.6 blades) should be checked in addition to fan blades and inlet cone as indicated below.

(1)Turbine exhaust area for metal particles
(2)2.9 bleed valves for metal particles
(3)Engine inlet
(4)Stage 1 LPC (fan) blades
(5)Inlet cone
(6)Stage 1.6 LPC stator rubstrip.

B. If inspection per Paragraphs A.(1) or A.(2) shows metal particles are present, the engine must be replaced.

C. If any or all of the Paragraphs A. (3) through A.(6) inspections reveals damage within serviceable limits but also shows evidence that a bird (object) was ingested through the core engine (damage to fan blades in area located adjacent to core engine, bird remains (damage) on compressor inlet vanes or in the 2.5 bleed screen, crew report of bird smell in cockpit, etc.) or the incident resulted in a surge followed by abnormal engine para-
R meters, do a borescope inspection of stages 5, 6 and 10 (Ref. Fig. 675) and if damage is noted do a borescope inspection of the entire high pressure compressor Stages 5 through 15. Particular attention is required for potential blade tip cracking or tip fracture of the 5th and 6th stage blades.
Such damage is cause for immediate engine removal (Ref. 72-00-00,
R P. Block 601).
R
If there is no evidence of core ingestion or a surge followed by abnormal
R engine parameters, borescope inspection of the high pressure compressor in not required.

NOTE : In some cases of engine core FOD or bird ingestion, damage to the HPC 5th and/or 6th stage blades may result. Evidence of blade tip cracks or fracture is possible. Inspection for this damage to the 5th stage blades can be more easily accomplished by using a flexible fiberoptic borescope with a direct vision deflecting tip and by gaining access through the engine core inlet or the 4th stage LPC 2.5 bleed ports. The 6th stage blades should be inspected by gaining access through the AP-2 borescope access port.

D. If inspection per Paragraph C. reveals damage within serviceable limits to

the exit, or rear, stages of the high pressure compressor, inspect the 1st stage turbine nozzle guide vanes and high pressure turbine (HPT) for damage.

22. Specific Fits and Clearances

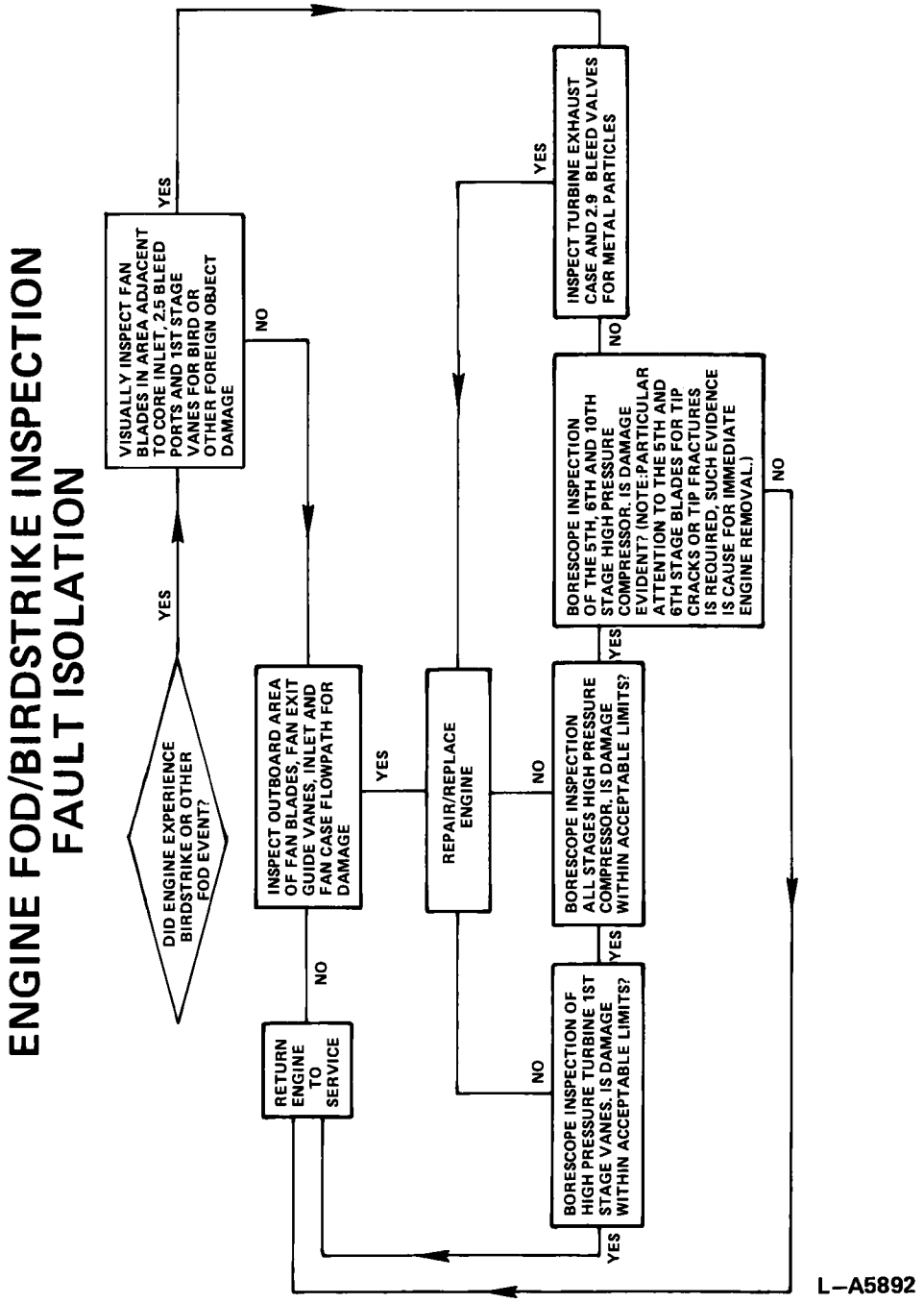
A. General
(1) Reference numbers on figures indicate location of parts for which fits and clearances are specified.
Description of, amd limits for, these fits and clearances are located in tables of corresponding reference numbers.
(2) Unless otherwise specified, all fits are diametral except spline fits, which are calculated for chordal dimensions, and blade tip clearance, which is radial.
(3) Numbers in all columns shall be interpreted in inches and millimeters.
(4) Letter "T" following limits indicates tight fit.
(5) Description column provides nomenclature for part or parts concerned.

B. Inspection Frequency Requirements
(1) IFR column provides Inspection Frequency Requirements. Letter Codes A, B or C located in IFR column indicate manner and frequency of inspection recommended for item identified by adjacent reference number, as applicable to normal or routine repair. Definitions for these codes are as follows :

IFR Code	Definition
A	Clearance or fit is calculated from part measurements at each installation of parts. Part measurements taken and recorded at time of individual part inspection are considered equally as valid as measurements taken at time of part installation.
B	Clearance or fit is estimated at each installation of parts. Use trial assembly or similar means to estimate clearance or fit. Measurement of parts and calculation of actual fit or clearance is required only if : - Estimating procedure indicates that clearance or fit may be outside specified tolerance.
C	Clearance or fit is not subject to change in normal engine operation.

C. New Part Reference Dimensions
(1) Dimensions are provided in this column for reference only.
(2) Dimensions are the Minimum and Maximum manufacturing values in inches (and millimeters) for each part listed in the description column.

D. Limits
(1) Limits applicable to any combination of new or used parts.
(a) This column provides the acceptable (minimum - maximum) range of fit or clearance in inches (and millimeters). These limits may be applied to any combination of new or used parts.
(b) The limits are based on the mathematical combination of the minimum and maximum values specified in the New Part Reference Dimensions


ENGINE FOD/BIRDSTRIKE INSPECTION
FAULT ISOLATION
VISUALLY INSPECT FAN BLADES IN AREA ADJACENT TO CORE INLET, 2.5 BLEED PORTS AND 1ST STAGE VANES FOR BIRD OR OTHER FOREIGN OBJECT DAMAGE
INSPECT TURBINE EXHAUST CASE AND 2.9 BLEED VALVES FOR METAL PARTICLES
BORESCOPE INSPECTION OF THE 5TH, 6TH AND 10TH STAGE HIGH PRESSURE COMPRESSOR. IS DAMAGE EVIDENT? (NOTE: PARTICULAR ATTENTION TO THE 5TH AND 6TH STAGE BLADES FOR TIP CRACKS OR TIP FRACTURES IS REQUIRED. SUCH EVIDENCE IS CAUSE FOR IMMEDIATE ENGINE REMOVAL.)
DID ENGINE EXPERIENCE BIRDSTRIKE OR OTHER FOD EVENT?
INSPECT OUTBOARD AREA OF FAN BLADES, FAN EXIT GUIDE VANES, INLET AND FAN CASE FLOWPATH FOR DAMAGE
REPAIR/REPLACE ENGINE
BORESCOPE INSPECTION ALL STAGES HIGH PRESSURE COMPRESSOR. IS DAMAGE WITHIN ACCEPTABLE LIMITS?
BORESCOPE INSPECTION OF HIGH PRESSURE TURBINE 1ST STAGE VANES. IS DAMAGE WITHIN ACCEPTABLE LIMITS?
RETURN ENGINE TO SERVICE
YES
NO
L-A5892

BM5 72 00 00 6 KDM0 00

Engine Foreign Object Damage (FOD)
Birdstrike Inspection - Fault Isolation
Figure 675

R

column. See Example 1.

(c)Limits which have been expanded to be less restrictive than new part conditions are identified with an asterisk (*) adjacent to the value. See example 2.

EXAMPLE 1

Ref. No.	I F R	Description	New Part Reference Dimensions Min - Max	Limits Min - Max
1812		Bearing ----	--- 0.508 (12.903) | 0.512 (13.005)	
		Support ----	--- 0.517 (13.131) | 0.527 (13.385)	0.005 (0.126) | 0.019 (0.482)

NOTE : In Example 1 limits are determined by comparing bearing and support referenced dimensions as follows :

0.517 (13.131) (-) 0.512 (13-005) = 0.005 (0.126)

0.527 (13.385) (-) 0.508 (12.903) = 0.019 (0.482)

EXAMPLE 2

Ref. No.	I F R	Description	New Part Reference Dimensions Min - Max	Limits Min - Max
1812		Bearing ----	--- 0.508 (12.903) | 0.512 (13.005)	
		Support ----	--- 0.517 (13.131) | 0.527 (13.385)	0.005 (0.126) | 0.020* (0.508)*

NOTE : In Example 2 limits represent less restrictive values as indicated by the asterisk (*).

(2)Limits for selective application to engines scheduled for partial refurbishment.

(a)A second set of limits enclosed by brackets and lines may be provided. See Example 3. These enclosed limits are less restrictive and are intended to be selectively applied to engines scheduled for partial refurbishment.

EXAMPLE 3

Ref. No.	I F R	Description	New Part Reference Dimensions Min - Max	Limits Min - Max
1812		Bearing ----	--- 0.508 (12.903) | 0.512 (13.005)	
		Support ----	--- 0.517 (13.131) | 0.527 (13.385)	0.005 (0.126) | 0.019 (0.482)
				0.005 (0.13 | 0.022 (0.56)

NOTE : In Example 3 the enclosed, (less restrictive) limits are intended for selective application, see text.

E. Fits and Clearances (Ref. Fig. 676, 677, 690)
(Ref. Fig. 696, 693, 694)
(Ref. Fig. 692, 695, 691)

Ref. No.	I F R	Description	New Part Reference Dimensions Min - Max	Limits Min - Max
490	B	Fan Exit (Outer) Case Fan Case Assembly		
		Exit Case ---	-- 90.334 (2294.48) | 90.344 (2294.74)	
		Fan Case ---	-- 90.318 (2294.08) | 90.328 (2294.33)	0.026T (0.66T) | 0.006T (0.15T)
491	B	Axial Gap Fan exit (Outer) Case Fan Case Assembly		
		Outer Case --	--- .215 (5.46) | .225 (5.72)	
		Fan Case ---	-- .225 (5.72) | .235 (5.97)	0.000 (0.00) | 0.020T (0.51)
761	A	Gap Compressor Blade (Stage 1) Lock Gap --------		0.010 (0.254) | 0.060 (1.524)
		Blade Lock Installed to Front Compressor Hub Assembly 32.989 (837.921) 32.999 (838.175) Diameter Retaining Groove		
762	B	Front Compressor Hub Assembly		

	Ref. No.	IFR	Description	New Part Reference Dimensions Min - Max	Limits Min - Max
			Compressor Inlet Cone (Rear) Segment Assembly		
			Hub ---	-- 27.378 (695.402) | 27.382 (695.502)	
R			Segment ---	-- 27.376 (695.350) | 27.384 (695.554)	0.028L* (0.71L*) | 0.006T (0.15T)
	841	B	No. 4 Bearing Cover Assembly Turbine Exhaust Case Assembly		
			Cover ---	-- 10.876 (276.251) | 10.878 (276.301)	
			Case ---	-- 10.880 (276.352) | 10.884 (276.453)	0.002 (0.051) | 0.008 (0.202)
	1027	B	Face (Oil Seal) Assembly Gearbox (Front Hydraulic Pump Drive) Bearing Support		
			Seal ---	-- 5.221 (132.614) | 5.226 (132.740)	
			Support ---	-- 5.228 (132.792) | 5.232 (132.892)	0.002 (0.051) | 0.011 (0.279)
	1028	B	Face (Oil) Seal Assembly Gearbox Housing Assembly		
			Seal ---	-- 4.618 (117.298) | 4.623 (117.424)	
			Housing ---	-- 4.6240 (117.450) | 4.6252 (117.480)	0.0010 (0.025) | 0.0072 (0.183)
	1824	B	Face (Oil) Seal Assembly Gearbox (Starter Drive) Bearing Housing Assembly		
			Seal ---	-- 3.3570 (85.268) | 3.3640 (85.445)	
			Housing ---	-- 3.3650 (85.471) | 3.3662 (85.501)	0.0010 (0.026) | 0.0092 (0.234)
	1827	B	Face (Oil) Seal Assembly Gearbox (Fuel Pump Drive) Bearing Housing Assembly		
			Seal ---	-- 3.3570 (85.268) | 3.3640 (85.445)	
			Housing ---	-- 3.3650 (85.471) | 3.3662 (85.501)	0.0010 (0.026) | 0.0092 (0.234)
	1835	B	Face Seal Assembly		

Ref. No.	IFR	Description	New Part Reference Dimensions Min - Max	Limits Min - Max
		Gearbox (Rear Hydraulic Pump Drive) Bearing Housing Assembly		
		Seal ---	3.3570 (85.268) - 3.3640 (85.445)	
		Housing ---	3.3650 (85.471) - 3.3662 (85.501)	0.0010 (0.026) - 0.0092 (0.234)
1854	B	Face (Oil) Seal Assembly Gearbox Housing Assembly		
		Seal ---	3.3570 (85.268) - 3.3640 (85.445)	
		Housing ---	3.3650 (85.471) - 3.3662 (85.501)	0.0010 (0.026) - 0.0092 (0.234)
1855	B	Face (Oil) Seal Assembly Gearbox Generator (FADEC Alternator) Housing Assembly		
		Seal ---	3.111 (79.020) - 3.116 (79.146)	
		Housing ---	3.118 (79.198) - 3.123 (79.324)	0.002 (0.05) - 0.012 (0.30)

F. Special Assembly Procedures

138 A Installation of Fan Exit Case Flange Assembly, Lower Segment, (Following Installation of Angle Gearbox To Intermediate Case)
(Ref. 72-63-00, P. Block 401 - Installation of the Angle Gearbox)

751 B Procedure For Checking Clearance Between Front And Rear Fan Exit Liners
(Ref. 72-23-05, P. Block 401 - Installation of Fan Exit Liner Segments (Inner Front))

1005 B Procedure For Maintaining Gap Between Fan Exit Case Bracket And Intermediate Case Liner
(Ref. Fig. 678)
(Ref. 72-23-05, P. Block 401 - Installation of Fan Exit Liner Segments (Inner Rear)

1010 B Procedure For Positioning Fan Exit Fairing Cover Plate
(Ref. 72-23-06, P. Block 401 - Installation of the Fan Exit (Bifurcation) Fairing Assemblies (Post SB PW4ENG 72-370))

1012 B Procedure For Checking Clearance Between Front And Rear Fan Exit Liners
(Ref. 72-23-06, P. Block 401 - Installation of the Fan Exit (Bifurcation) Fairing Assemblies (Post SB PW4ENG 72-370))
(Ref. 72-23-05, P. Block 401 - Installation of Fan Exit Liner Segments (Inner Front)).

2016 A Procedure For Installing The Oil Trim Pressure Tube Clamping
(Ref. 72-65-01, P. Block 401 - Installation of the Main Gearbox)

G. Special Torques (Ref. Fig. 679, 680, 682)
(Ref. Fig. 685, 687)

571 A Thermocouple Locknut
(Ref. 72-65-01, P. Block 601 - Inspection of the Main Gearbox for Leaks, Cracks and Corrosion)

572 A Thermocouple Nut
(Ref. 72-65-01, P. Block 601 - Inspection of the Main Gearbox for Leaks, Cracks and Corrosion)

1552 A Stage 6 Borescope Plug
(Ref. Fig. 681)
(Ref. 72-00-00, P. Block 601) (General Borescope Inspection Procedure)

1554 A Stage 5 Borescope Plug
(Ref. Fig. 681)
(Ref. 72-00-00, P. Block 601) (Borescope Inspection Procedure)

1555 A Stages 10 (Outer) and Stage 14 (Outer) Borescope Plugs
(Ref. Fig. 683, 688)
(Ref. 72-00-00, P. Block 601, (Borescope Inspection Procedure)

1556 A Stages 8 and 12 Borescope Plugs
(Ref. Fig. 683, 686)
(Ref. 72-00-00, P. Block 601, (Borescope Inspection Procedure)

1557 A Stage 10 (Inner) Borescope Plug
(Ref. Fig. 684)
(Ref. 72-00-00, P. Block 601, (Borescope Inspection Procedure)

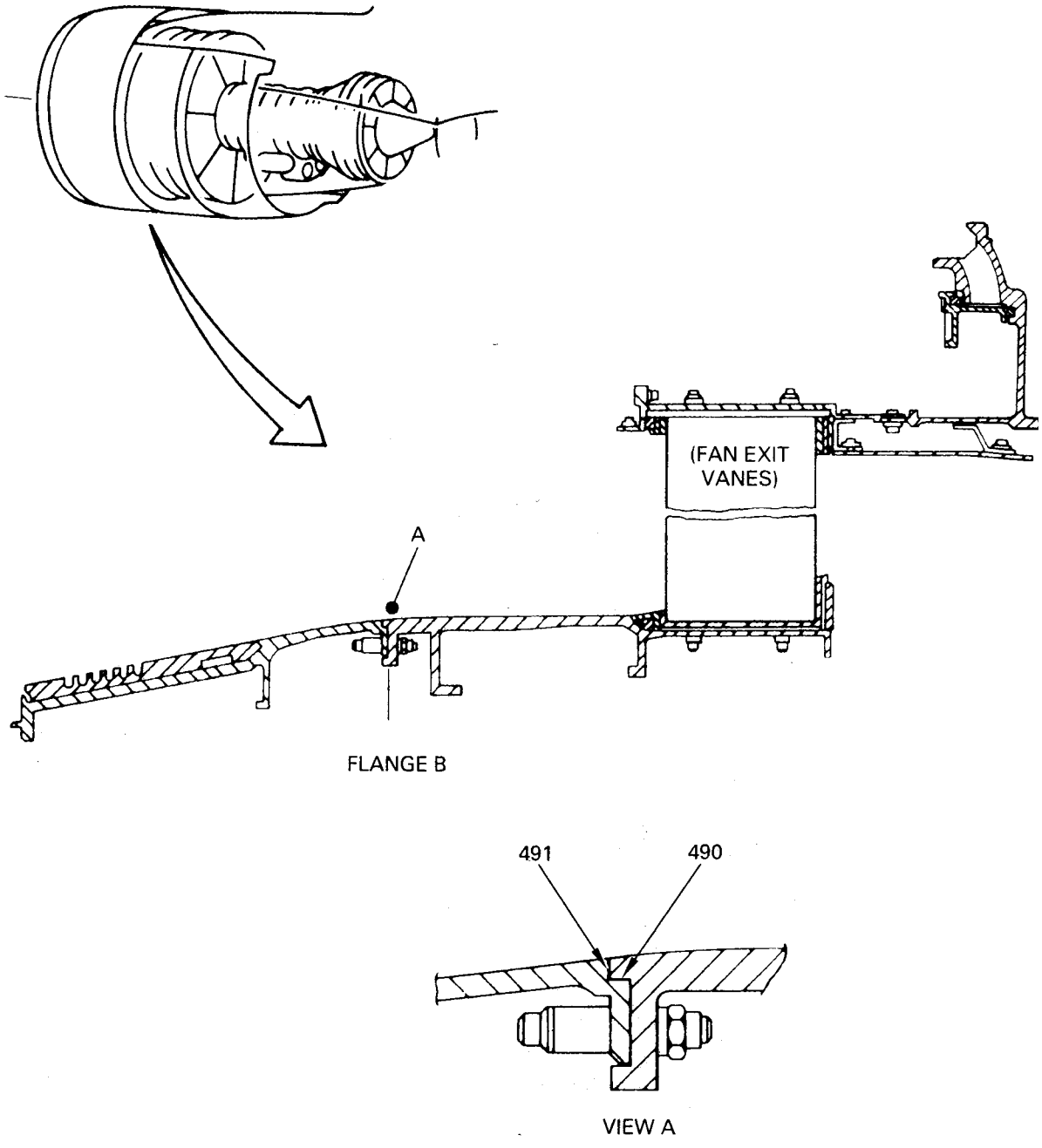
1559 Stage 14 (Inner)
Borescope Plug (Ref. Fig. 689)
(Ref. 72-00-00, P. Block 601, (Borescope Inspection Procedure)

2151 Hose/Tube Clamp Screws
(Ref. 75-24-07, P. Block 401)

23. Inspection for Engines Exposed to Fire or Fire Extinguishing Agents

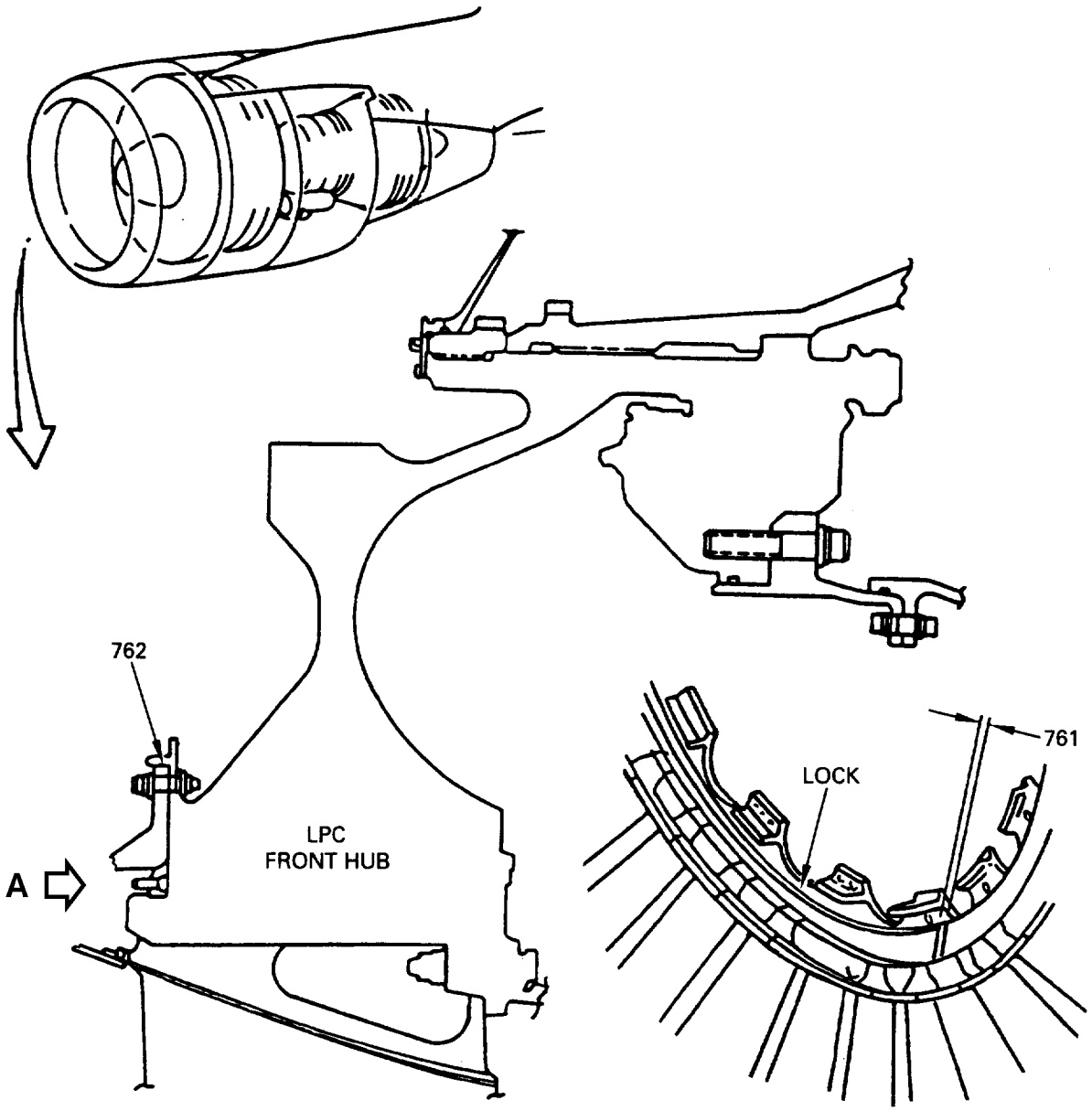
A. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedures	
- 29-00-00, P. Block 301	Hydraulic Power - General
- 72-00-00, P. Block 701	Engine - General



BM5 72 00 00 6 KATO 01

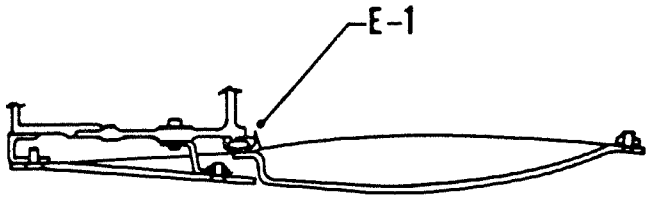
Fan Cases
Figure 676



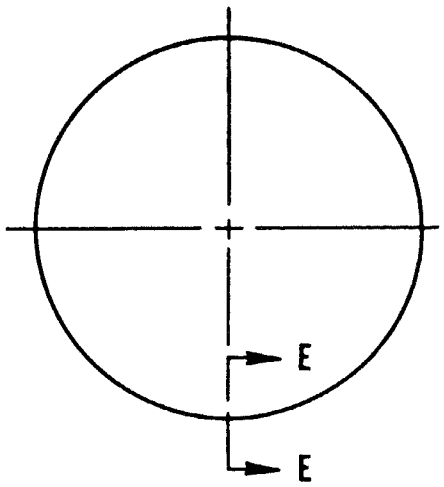
BM5 72 00 00 6 KCT0 02

L-A3302 (0697)

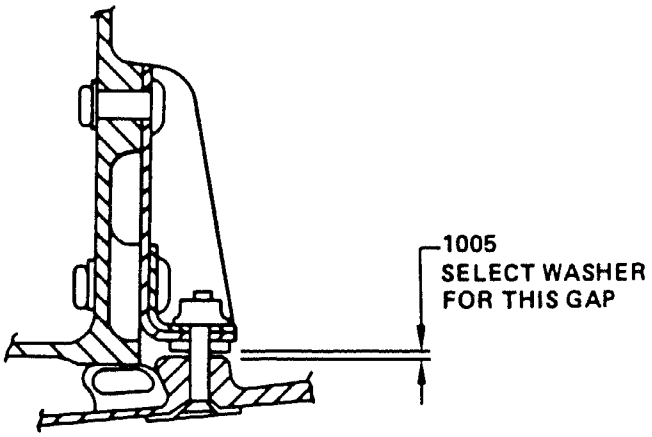
Low Pressure Compressor (LPC)
Figure 677



SECTION E-E



SCHEMATIC REAR VIEW
INTERMEDIATE CASE

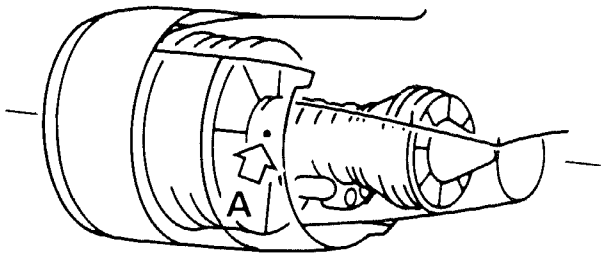


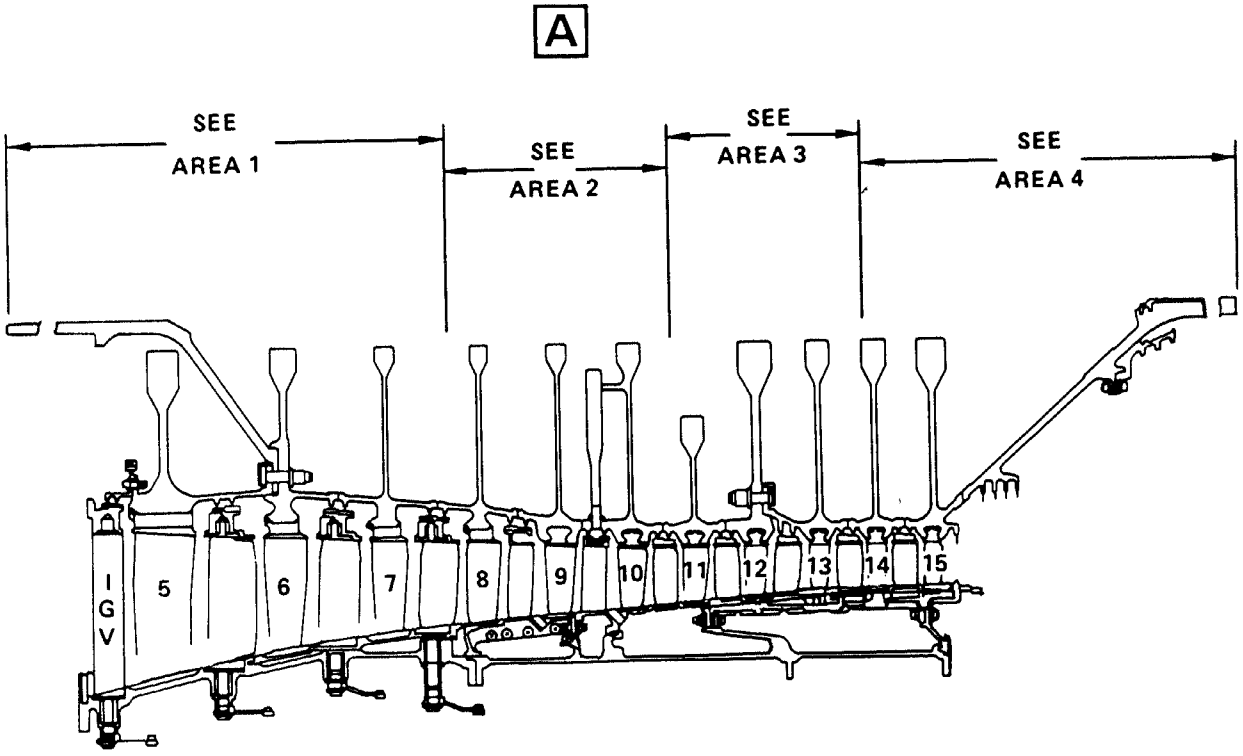
VIEW E-1

BM5 72 00 00 6 KETO - 21

L - A2695

Fan Cases
Figure 678



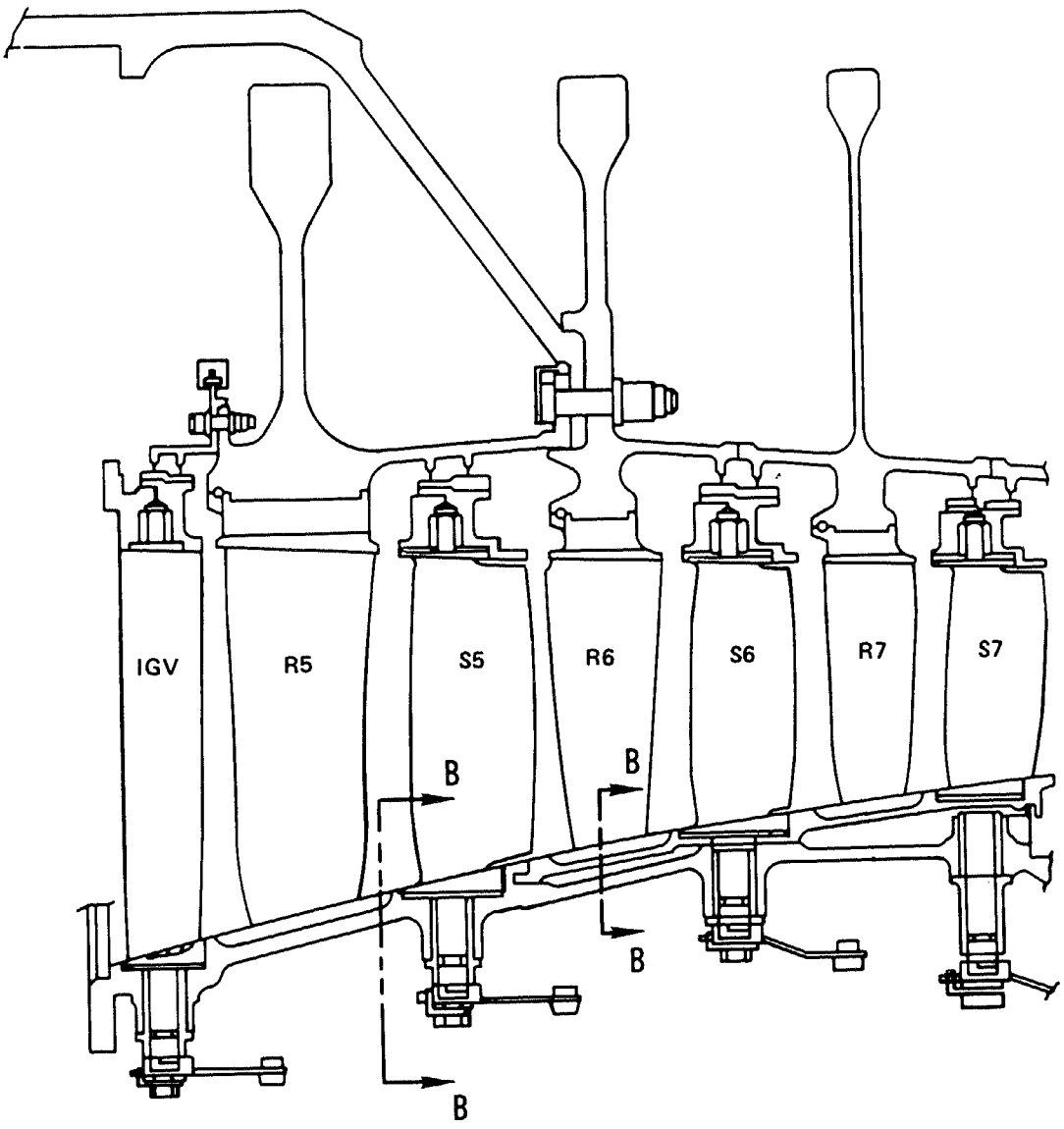


HPC

L—A2702

BM5 72 00 00 6 KGTO - 21

High Pressure Compressor (HPC)
Figure 679

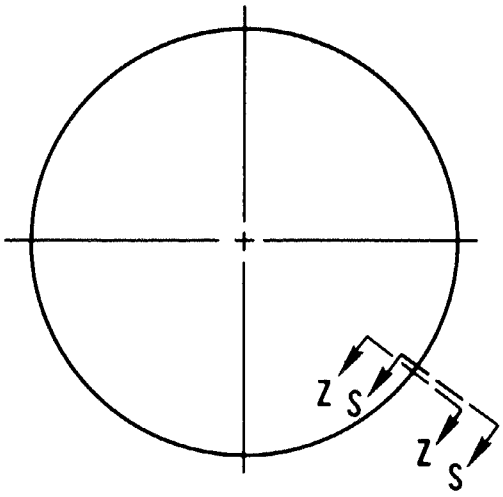


L–A2703

(HPC, AREA 1)

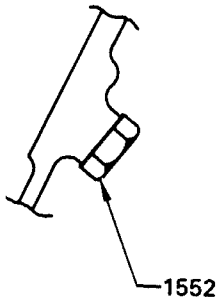
BM5 72 00 00 6 KJTO - 21

HPC - (Area 1)
Figure 680

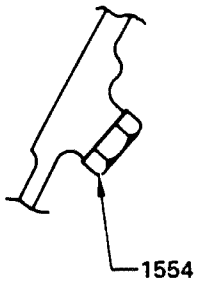


SCHEMATIC SECTION B-B (HPC, AREA 1)
BOROSCOPE BOSS

TYPICAL 2 PLACES



SECTION S-S
(STAGE 6)

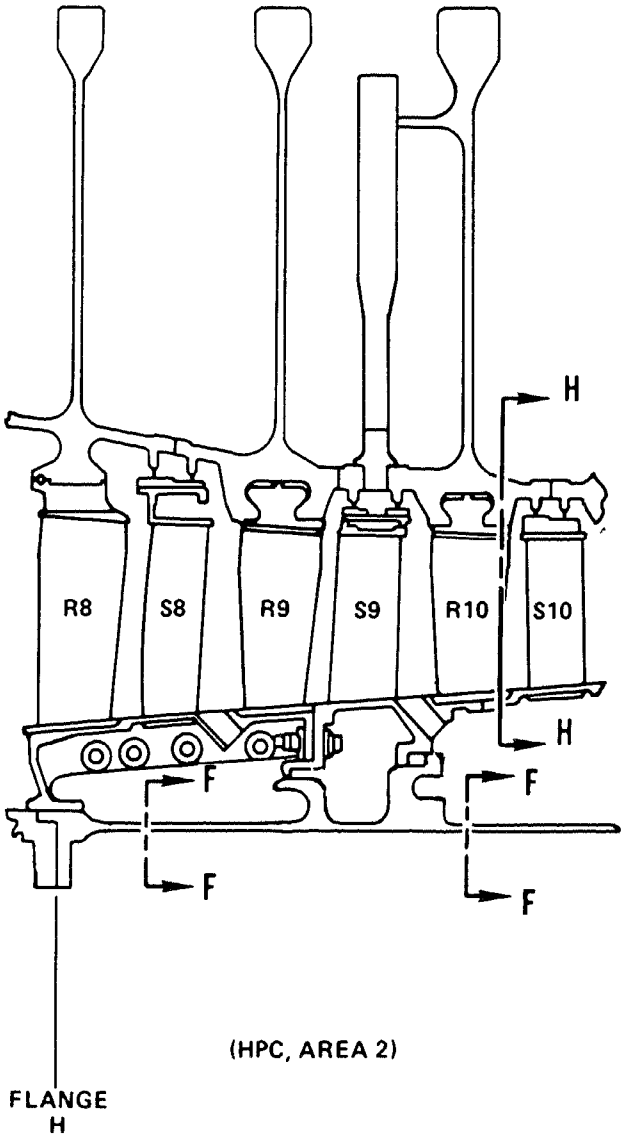


SECTION Z-Z
(STAGE 5)

BM5 72 00 00 6 KLTO - 21

L-A2704

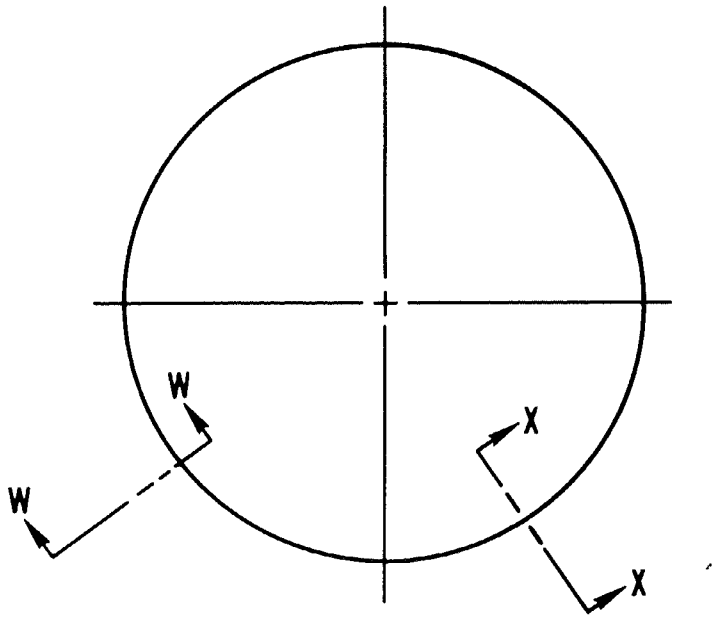
HPC - (Stage 5 and 6)
Figure 681



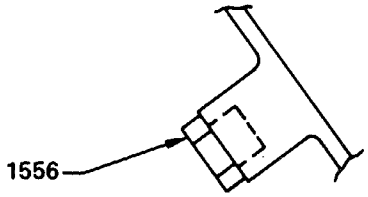
BM5 72 00 00 6 KNTO - 21

L-A2705

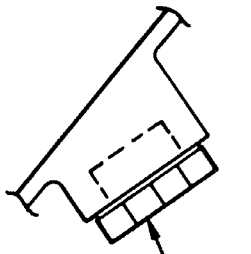
HPC - (Area 2)
Figure 682



SCHEMATIC SECTION F – F (HPC, AREA 2)
BOROSCOPE BOSS



SECTION W – W
(STAGE 8)

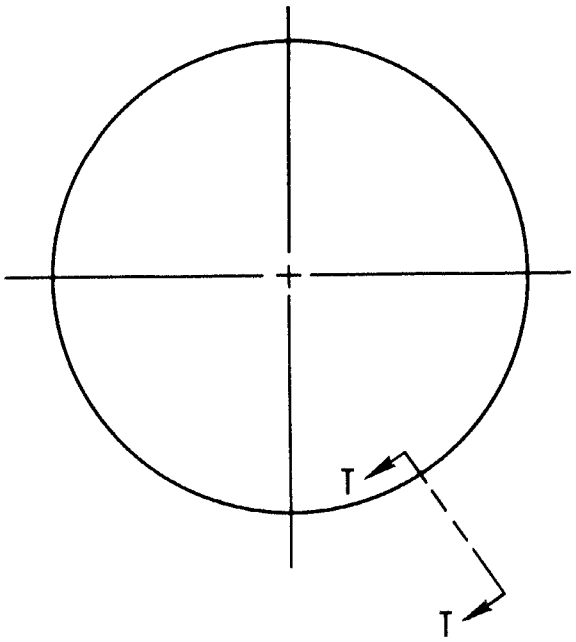


SECTION X – X
(STAGE 10)

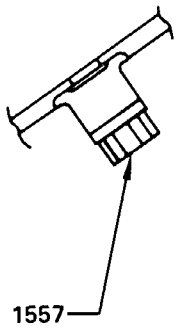
L–A2707

BM5 72 00 00 6 KPTO - 21

HPC - (Stage 8 and 10)
Figure 683



SCHEMATIC SECTION H-H
BOROSCOPE BOSS
(HPC, AREA 2)

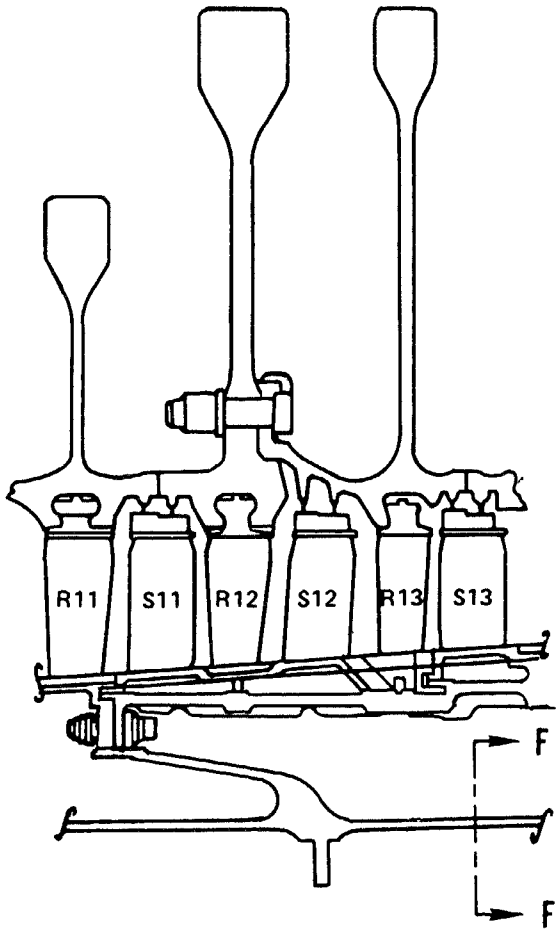


L-A2708

SECTION T-T
(STAGE 10)

BM5 72 00 00 6 KRTO - 21

HPC - (Area 2, stage 10)
Figure 684

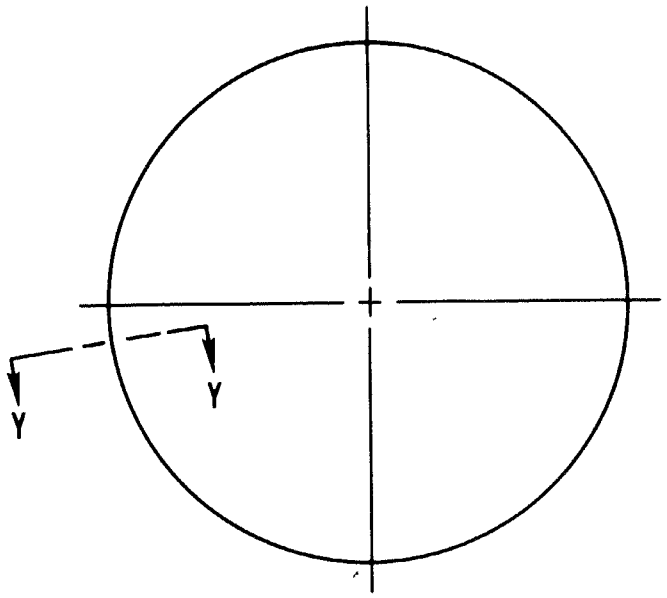


(HPC, AREA 3)

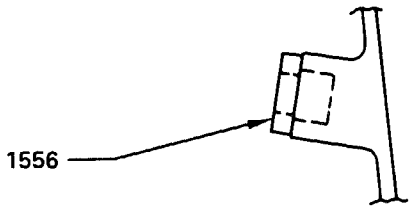
BM5 72 00 00 6 KTTO - 21

L-A2709

HPC - (Area 3)
Figure 685



SCHEMATIC SECTION F-F
BOROSCOPE BOSS
(HPC, AREA 3)

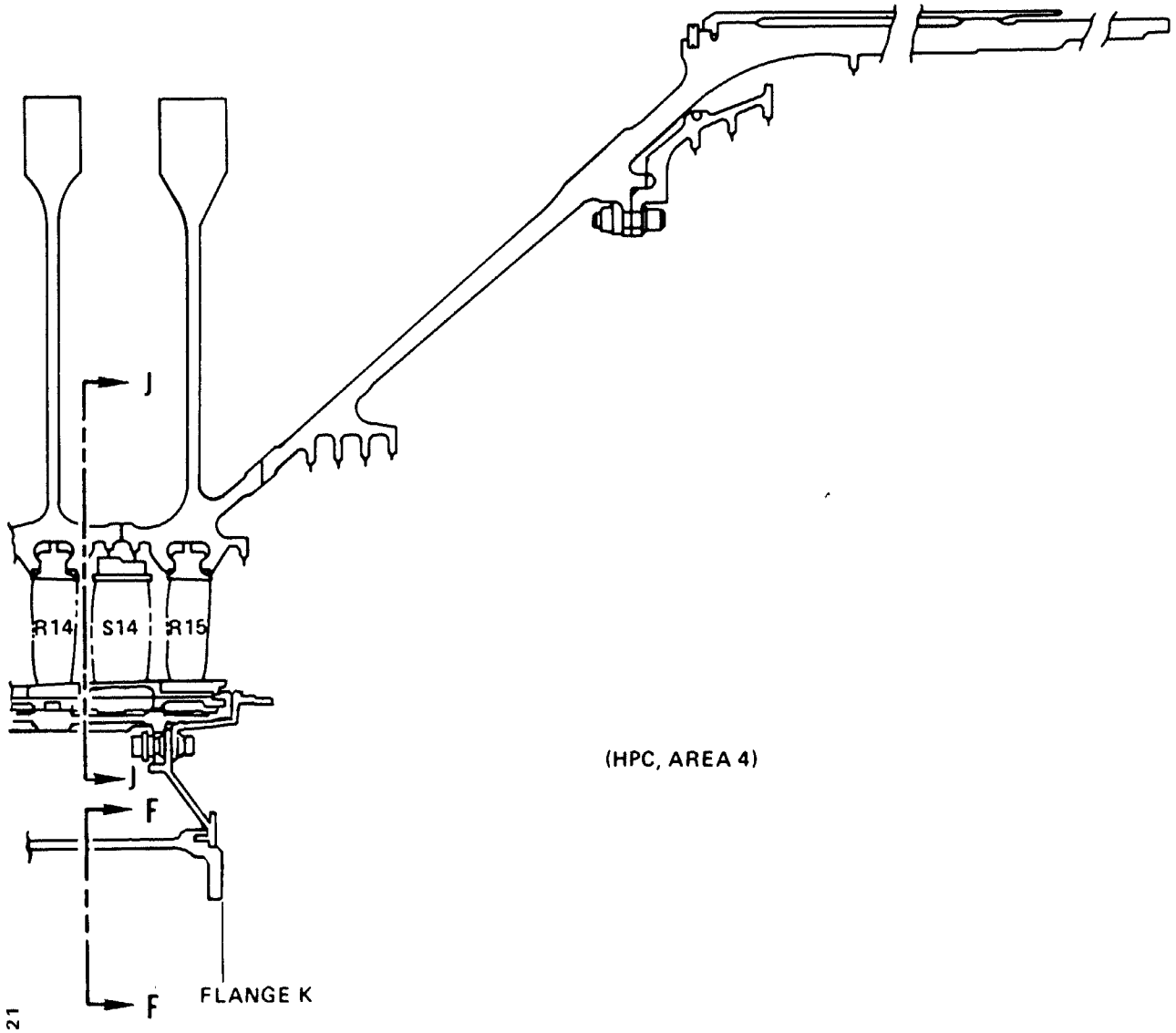


SECTION Y-Y
(STAGE 12)

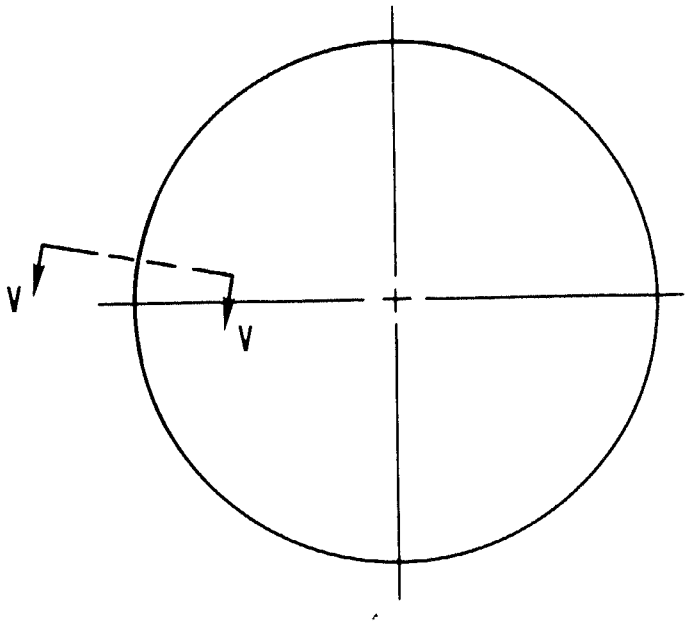
BM5 72 00 00 6 KVTO - 21

L-A2710

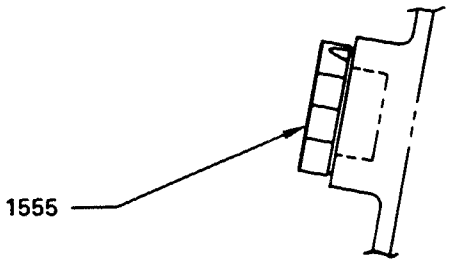
HPC - (Area 3, stage 12)
Figure 686



HPC - (Area 4)
Figure 687



SCHEMATIC SECTION F-F
BOROSCOPE BOSS
(OUTER)
(HPC, AREA 4)

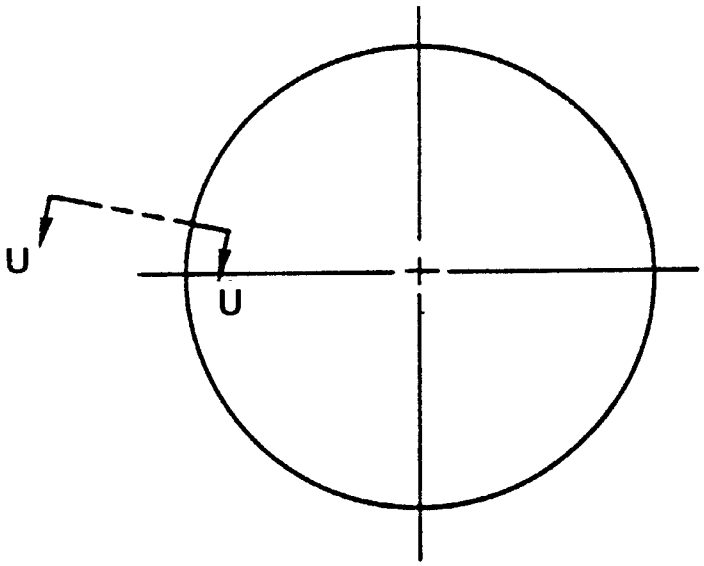


SECTION V-V
(STAGE 14 OUTER)

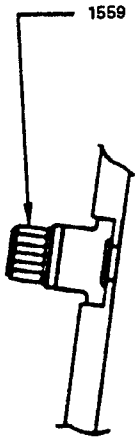
L-A2712

BM5 72 00 00 6 KZTO - 21

HPC - (Area 4, Stage 14 Outer)
Figure 688



SCHEMATIC SECTION J - J (HPC, AREA 4)
BOROSCOPE BOSS
(INNER)

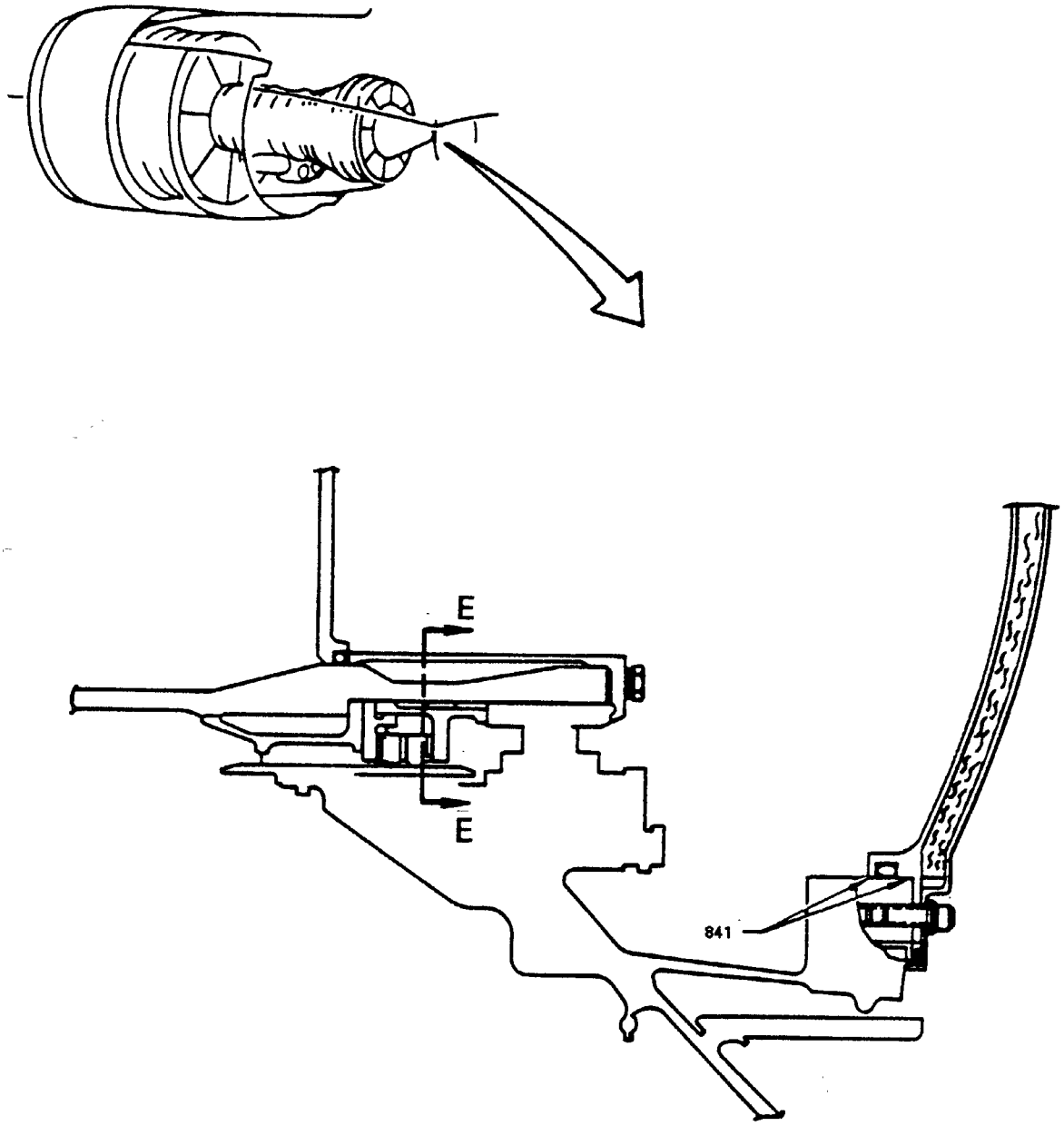


SECTION U - U
(STAGE 14 INNER)

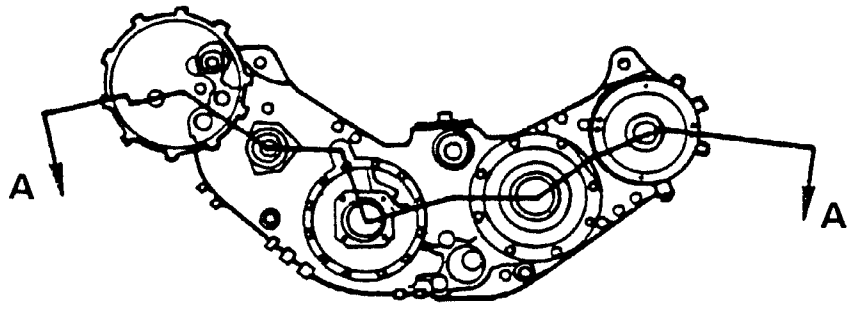
BM5 72 00 00 6 KAXO - 00

L - A2713
0487

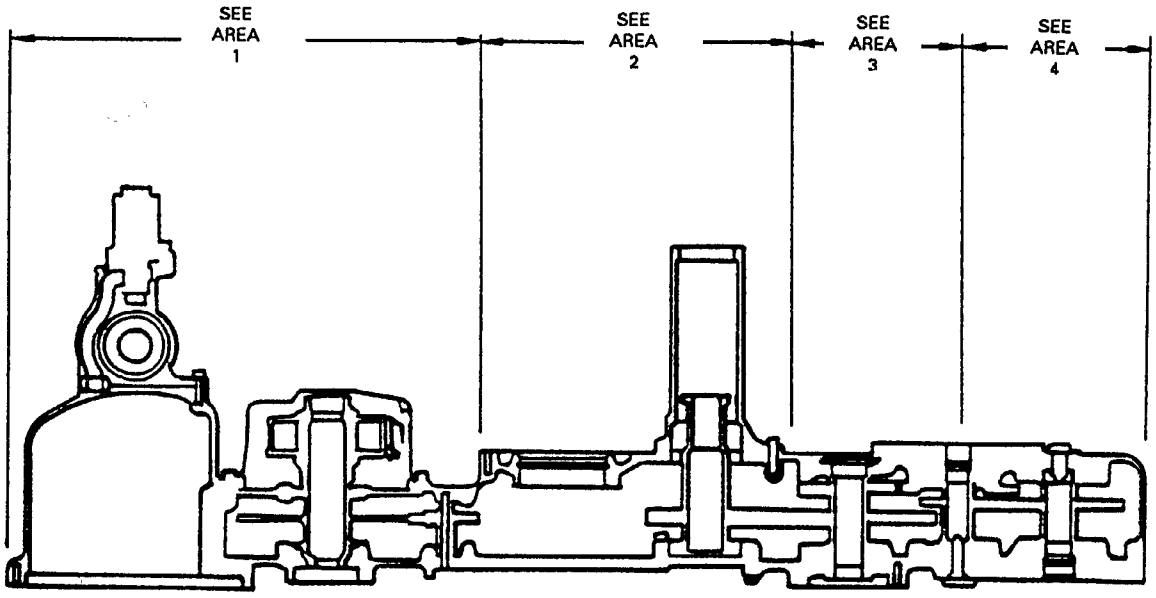
HPC - (Area 4, Stage 14 Inner)
Figure 689



Turbine Exhaust Case
Figure 690



REAR VIEW

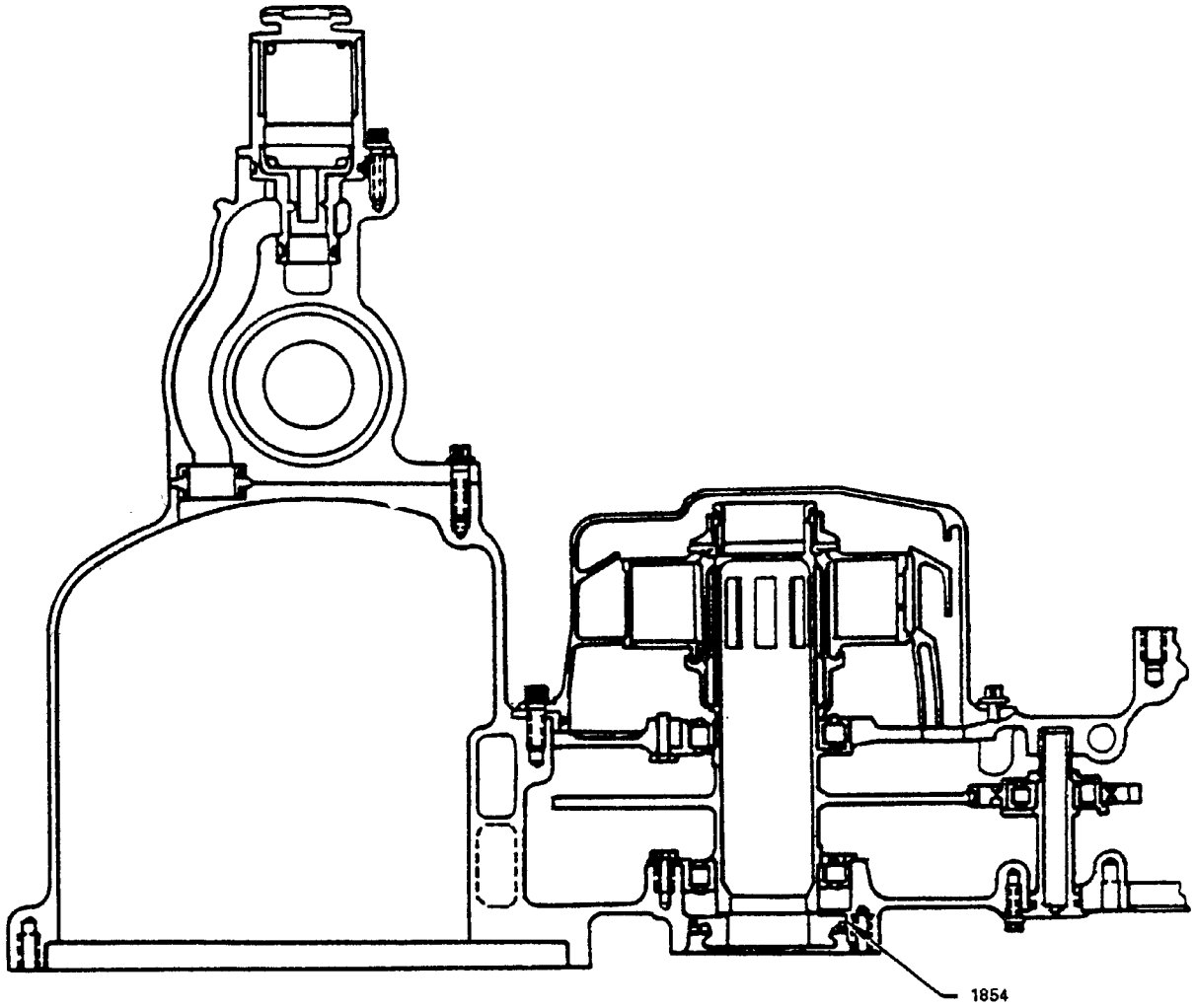


SECTION **A - A**

BM5 72 00 00 6 KEXO - 00

L - A0607

Main Gearbox
Figure 691

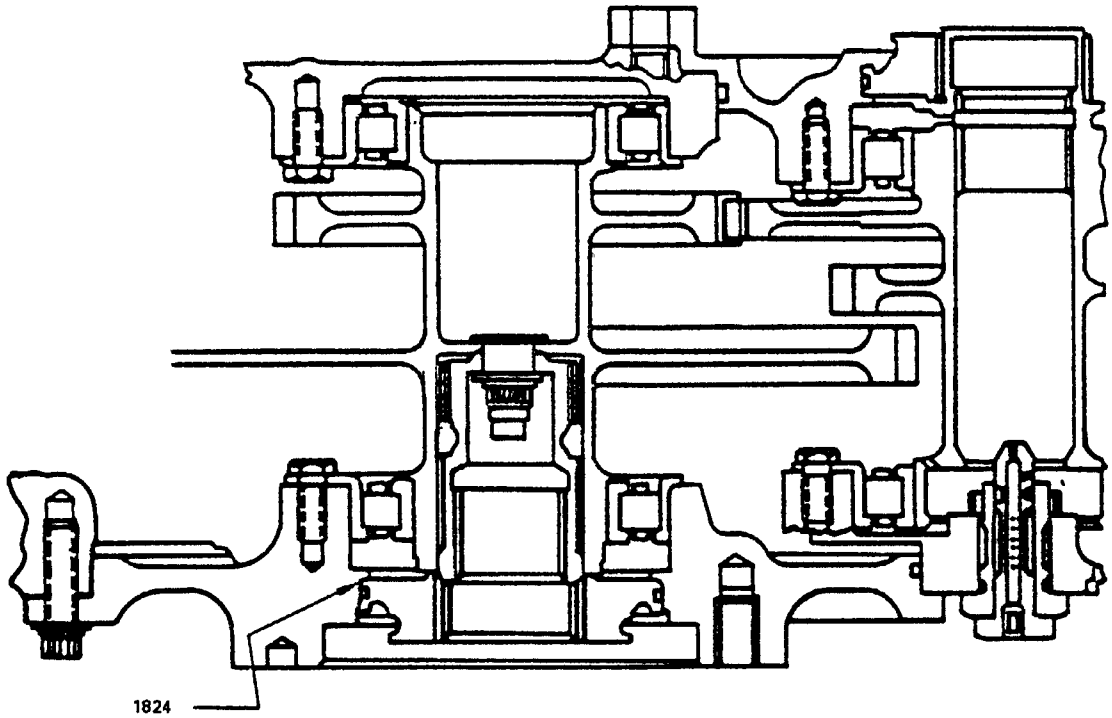


SECTION A-A (CONT.)
AREA 1

BM5 72 00 00 6 KGXO - 00

L-A2714

Main Gearbox (Area 1)
Figure 692

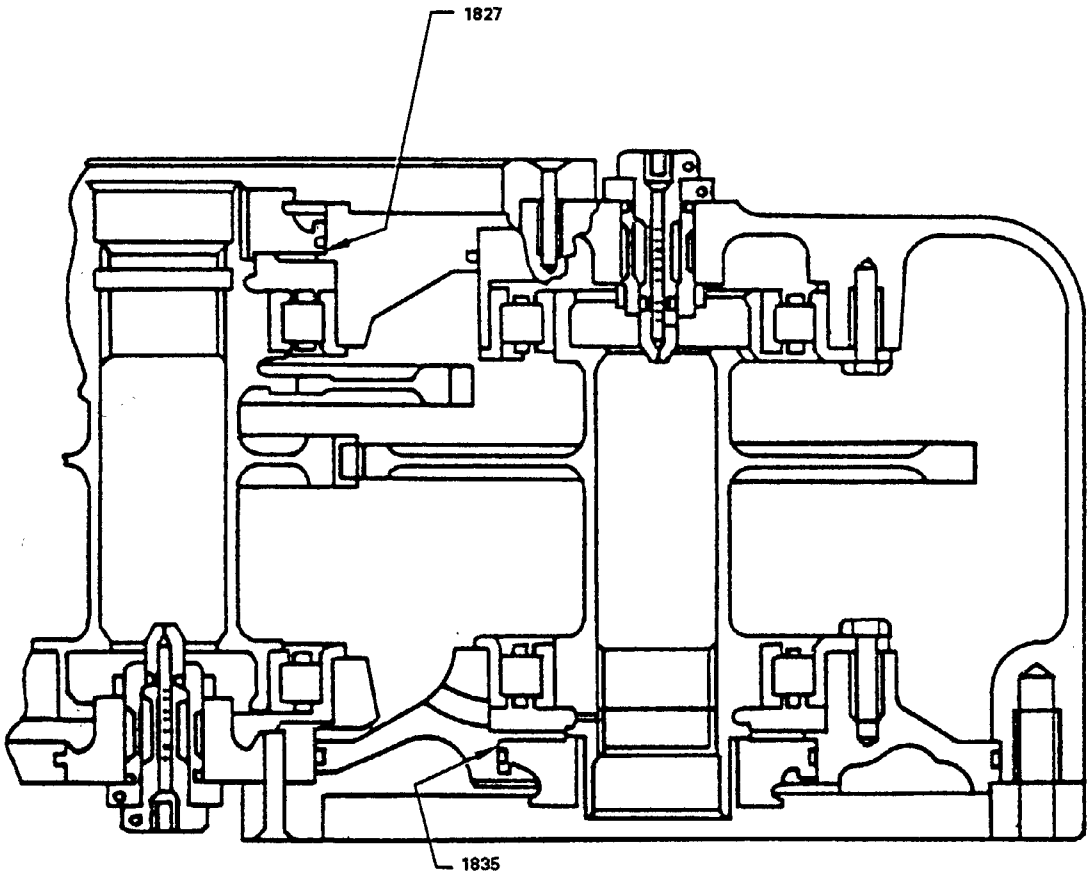


SECTION A - A (CONT.)
AREA 3

BM5 72 00 00 6 KJXO - 00

L - A2715

Main Gearbox (Area 3)
Figure 693

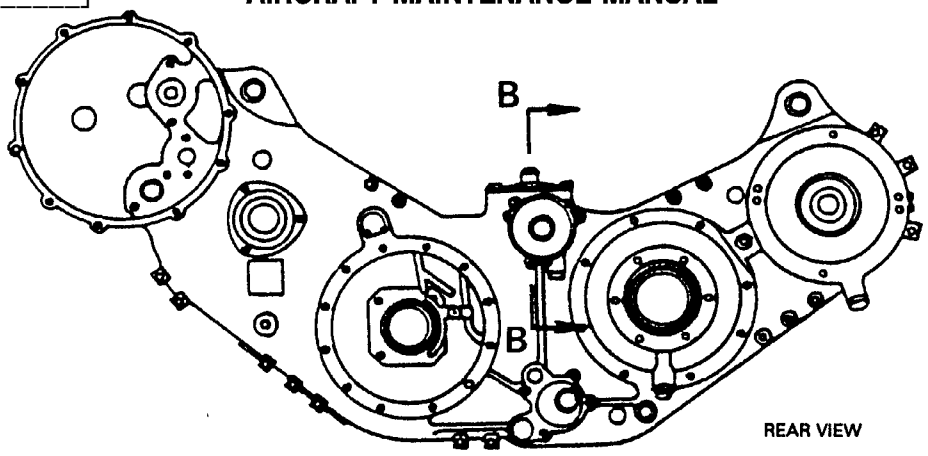


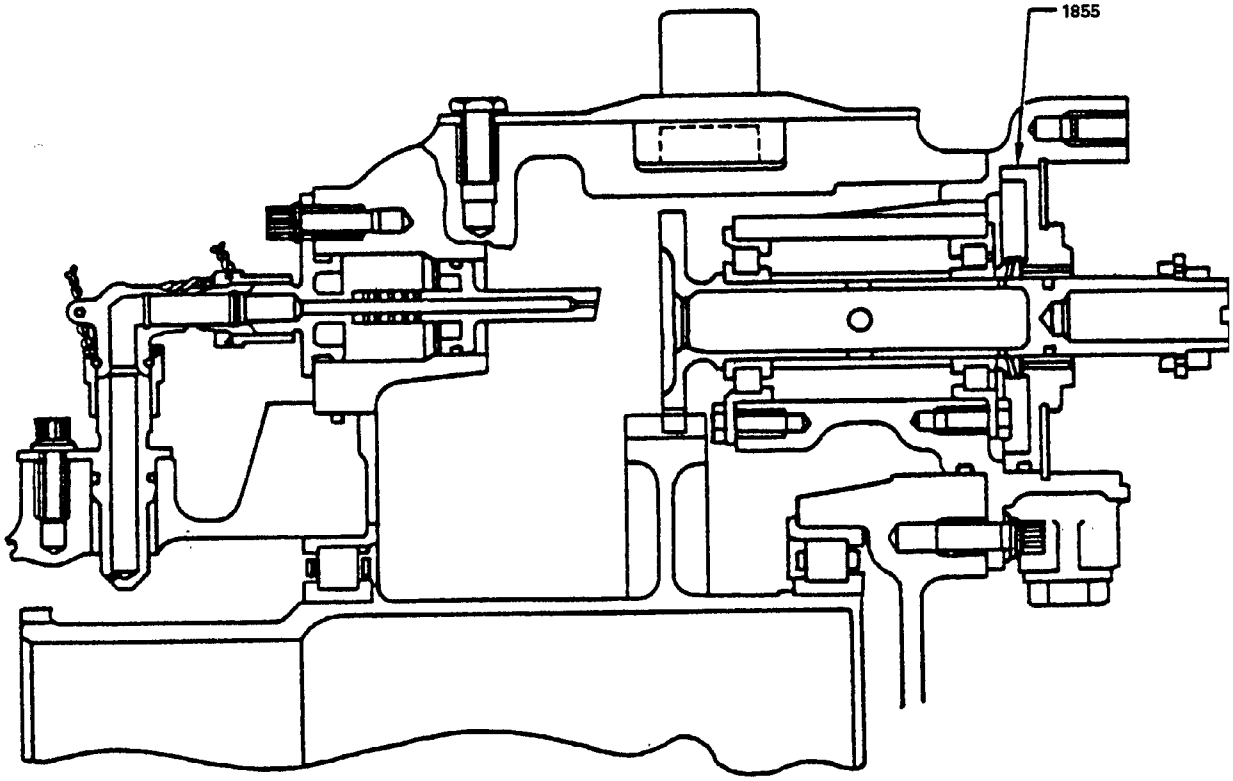
SECTION A - A (CONT.)
AREA 4

BM5 72 00 00 6 KLXO - 00

L - A2716

Main Gearbox (Area 4)
Figure 694

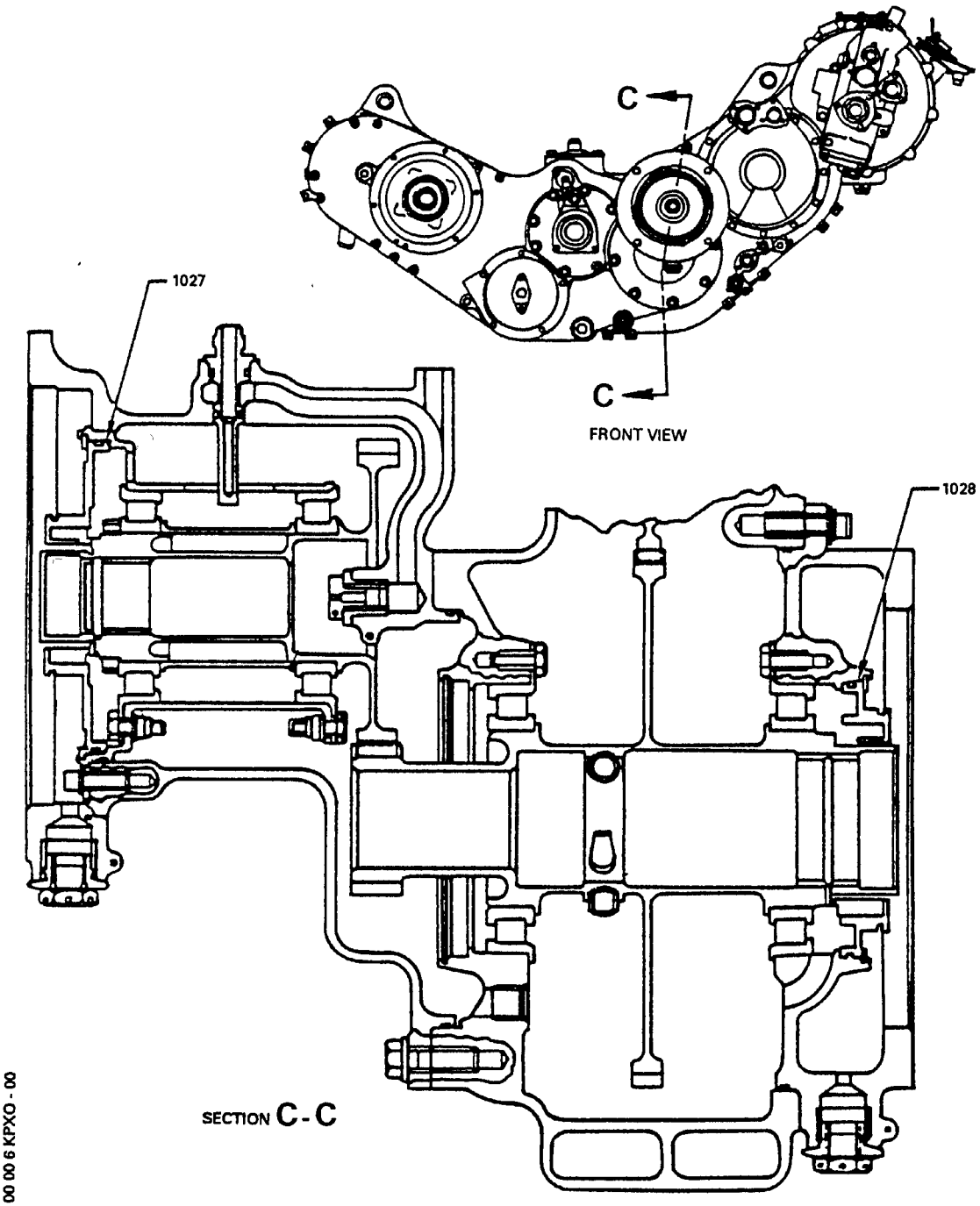




BM5 72 00 00 6 KNXO - 00

L - A2720

Main Gearbox
Figure 695



Main Gearbox (Front Hydraulic Pump Drive)
Figure 696

B. Fire Damage
(1)All engines damaged by fire require special inspection which exceeds the normal inspection requirements. For special instruction for relative engine parts, contact your Pratt & Whitney representative.

C. Exposure to Fire Extinguishing Agents
(1)If the engine has been exposed to fire extinguishing agents, hydraulic fluid, oils or fuel (Ref. 72-00-00, P. Block 701).

24.Accomplish Engine Preservation

A. Equipment and Materials

R	ITEM	DESIGNATION
	(1)CTE 3160	Cart, Preservation or equivalent
	(2)PWA 85433	Adapter, Fuel Preserve, Fuel Pump Inlet
	(3)PWA 85451	Adapter, Fuel Preserve, Fuel Flowmeter Outlet
	(4)Material No.P03-001	Oils (Ref. 70-00-00)
	(5)Material No.P03-002	Oils (Ref. 70-00-00)
	(6)Material No.P06-002	Lubricant (Ref. 70-00-00)
	Referenced Procedures	
	- 12-13-79, P. Block 001	Engines (Engine Oil System)
	- 70-00-00, P. Block 201	Engine - Standard Practicies
	- 71-00-00, P. Block 201	Power Plant - General - Maintenance Practices
	- 71-13-00, P. Block 301	Cowl Doors
	- 73-12-03, P. Block 401	Filter - Fuel
	- 79-21-03, P. Block 401	Filter - Oil
	- 79-22-03, P. Block 401	Magnetic Chip Collectors
	- 80-13-01, P. Block 401	Pneumatic Starter Assembly

B. General
(1)This task gives instructions to preserve the engine for 60 days or less (Method I).
(2)If the engine is to be stored for more than 60 days, refer to Preservation for More Than 60 Days (Method II).
(3)If you are not sure how much time the engine will not be used, use the preservation procedure that is necessary for the longer time.
(4)It will be necessary to air motor or run the engine in a test cell to preserve the engine for more than 60 days.
(5)For general preservation procedures, refer to SPOP 428 (Ref. 70-00-00, P. Block 201).
(a)Refer to the method shown for "New Delivered Engines" for a new engine received from Pratt and Whitney.
(b)To preserve engines For 60 Days or Less, refer to "In Service Engine Going into Storage For 60 Days Or Less (Method I)" for in service engines.

C. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open fan and

thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

D. Preservation of the Engine for 60 Days or Less (Method I)

(1)Preserve the oil system as follows :

CAUTION : IT IS RECOMMENDED THAT THIS PROCEDURE BE ACCOMPLISHED IN A TEST CELL OR SIMILARLY CLEAN AND PROTECTED AREA TO MINIMIZE NOISE, SAFETY HAZARDS AND POTENTIAL DAMAGE TO ROTATING, AIR FLOWING MACHINERY. CHOCKS OR SIMILAR RESTRAINT OF TRANSPORT STANDS ARE ALSO RECOMMENDED.

(a)Drain the engine oil as follows :

1 Remove the magnetic chip collector assemblies and valve assemblies from the main gearbox and oil tank (Ref. 79-22-03, P. BLock 401). Let the oil drain into containers.

2 Remove the main oil filter (Ref. 79-21-03, P. Block 401). Let the oil drain into containers for approximately one-half hour.

3 Install a new oil filter (Ref. 79-21-03, P. Block 401).

4 Install the magnetic chip collector assemblies and valve assemblies (Ref. 79-22-03, P. Block 401).

(b)Fill and service the oil tank (Ref. 12-13-79, P. Block 001).

(c)Install the starter (if not previously installed) (Ref. 80-13-01, P. Block 401). Be sure the starter is serviced.

(d)For engines that cannot be started and operated, motor the engine with the starter at a starter inlet air pressure of 15 psi (103.4 KPa) minimum. Make sure that the fan (LPC) is turning during motoring. If necessary increase the starter inlet air pressure to turn the fan (LPC). The maximum starter inlet air pressure is 50 psi (344.7 KPa). Continue to motor the engine for five minutes. This will flow the oil through the engine. Be sure not to run more than the starter operation time limits.

(e)For engines that can be started and operated, ground run the engine by Paragraph E.(2) of this procedure.

(f)Remove drain plugs from bottom of oil tank and bottom of gearbox. Allow engine oil to drain to a slow drip (approximately 1/2 hour). Reinstall drain plugs.

(g)Remove any accessory drive pad covers from the main gearbox. Spray the drive pads with Engine Oil (Material No.P03-001). Install any removed covers.

(h)Write the date of preservation on a tag and attach it to the oil filler cap.

(2)Preserve the main gearbox as follows :

CAUTION : DO NOT SPRAY PRESERVATIVE OIL (MATERIAL NO.P03-002) IN THE ENGINE GAS PATH AS POSSIBLE DIRT DEPOSITION ON THE BLADES AND VANES WIll REDUCE ENGINE EFFICIENCY.
HYDRAULIC FLUID CAN SERIOUSLY CORRODE THE MAIN GEARBOX HOUSING DURING PROLONGED PERIODS OF INOPERATION. ANY HYDRAULIC FLUID SPILLED ON THE MAIN GEAR BOX HOUSING SHOULD BE IMMEDIATELY CLEANED OFF WITH A TRICHLORETHYLENE SOAKED CLOTH.

(a)Examine the gearbox for hydraulic fluid on the gearbox housing. If you see the hydraulic fluid, you must remove it from the housing.

(b)If necessary, use a rag and clean the housing by SPOP 1 Degreasing of Engine Externals or by SPOP 208 Degreasing Of Parts by Solvent

Wiping (Ref. 70-00-00, P. Block 201).
(c)If any of the accessories are removed from the main gearbox housing, spray Engine Oil (Material No.P03-001) on the gearbox drive pads.
(d)Install accessory gearbox covers on the gearbox.
(3)Seal the engine for storage as follows :
(a)Install a cover, tarp of PVC plastic sheet over the engine intake area.
(b)Install a cover, tarp of PVC plastic sheet over the engine exhaust area.
(c)If possible, store the engine inside a building.
(4)If the engine will stay in storage for more than the 60 days limit, do the above steps again.
(5)Make a record for each engine as follows :
(a)Record the method of the preservation.
(b)Record the date of the preservation.
(c)Record that the oil system is drained.

E. Preservation of the Engine For More Than 60 Days (Method II)
(1)Preserve the engine oil system as follows :
(a)Drain the engine oil as follows :
1 Remove the magnetic chip collector assemblies and valve assemblies from the main gearbox and the oil tank (Ref. 79-22-03, P. Block 401). Let the oil drain into containers.
2 Remove the main oil filter (Ref. 79-21-03, P. Block 401). Let the oil drain into containers for approximately one-half hour.
3 Install a new oil filter (Ref. 79-21-03, P. Block 401).
4 Install the magnetic chip collector assemblies and valve assemblies (Ref. 79-21-03, P. Block 401).
(b)Fill and service the oil tank (Ref. 12-13-79, P. Block 001).
(2)Ground run the engine, (optional to motor procedure).
(a)Start the engine (Ref. 71-00-00, P. Block 201). Set minimum idle and hold for five minutes.
(b)Set power at 1.13 - 1.14 EPR and hold for five minutes after main oil temperature has reached 220°F (104°C) or more. Continue to operate the engine for five minutes.
(c)Decrease power setting to minimum idle and hold for five more minutes
(d)Do an engine shutdown by the Normal Engine Shutdown Procedure (Ref. 71-00-00, P. Block 201).
(e)For engines that cannot be started and operated, motor the engine with the starter at a starter inlet air pressure of 15 psi (103.4 KPa) minimum. Make sure that the fan (LPC) is turning during motoring. If necessary increase the starter inlet air pressure to turn the fan (LPC). The maximum starter inlet air pressure is 50 psi (344.7 KPa). Continue to motor the engine for five minutes. This will flow the oil through the engine. Be sure not to run more than the starter operation time limits.
(3)Motor the engine, (optional to engine operation).
NOTE : This alternate method to motor the engine can be used when a test cell is not available to test the engine.
CAUTION : MAKE SURE THAT THE ENGINE IS CORRECTLY INSTALLED IN THE DOLLY STAND AND THE WHEELS OF THE STAND ARE LOCKED. TO PREVENT DAMAGE TO THE STARTER, DO NOT OPERATE THE STARTER

FOR MORE THAN THE STARTER TIME LIMIT.

(a)Connect the external supply pressure source to the starter air valve. A standard aircraft pneumatic start cart can be used.

NOTE : You can use a locally manufactured coupling to connect the external supply pressure source to the starter air valve.

WARNING : DO NOT TRY TO TURN THE FAN ROTOR BY HAND WITHOUT THE USE OF HEAVY PROTECTIVE GLOVES. MAKE SURE YOU HAVE SAFE, FIRM FOOTING. USE CARE TO PREVENT PERSONAL INJURY.

(b)Dry motor the engine with the starter for three minutes (optional to engine operation). If necessary, increase the starter inlet air pressure to turn the fan (LPC). The maximum starter inlet air pressure is 50 psi (344.7 KPa).

(c)When you dry motor the engine, the fan (LPC) must turn. This is necessary to get oil through all of the engine oil system. Be careful not to run more than the starter operation time limits.

(d)Stop motoring the engine and permit the engine to come to a full stop.

(e)Analyse engine oil for water content as follows :

1 Take 4 oz. or 100 ml sample of engine oil.

2 Conduct Karl Fisher ASTMD-1744 Water Analysis to determine water content in oil.

3 If water content is above 800 parts per million (ppm) either by weight or volume, replace engine oil (Ref. 12-13-79, P. Block 001), with new uncontaminated oil.

NOTE : Maximum allowable amount of water in new and used PWA-521B Type 2 synthetic oils in engine is 800 ppm.

(f)Analyse engine oil for acid content as follows :

1 Take 4 oz. or 100 ml sample of engine oil.

2 Use ASTMD-664 Total Acid Number (TAN) (titrated to PH 11.0) analysis to compare acid content of oil.

3 Determine TAN for batch of new oil of type being used to service engines.

NOTE : PWA-521B Type 2 synthetic oils vary in TAN by brand and manufacturer.

4 Determine TAN for engine oil sample.

5 If TAN for engine oil sample is more than 0.2 above TAN determined for a batch of new oil, then engine oil is considered to have degraded and should be replaced with new oil having an acceptable TAN.

(g)If either water or acid content was over limits, replace oil by oil system preservation, refer to preserve the oil system and then run the engine by Paragraph 1.C.(1)(a) through (d) of this procedure to distribute oil throughout the system.

(4)Fuel System Preservation - Pressure Feed Method to Preserve the Engine Fuel System (For Engines That Will Be Inactive For Over 60 Days) (Optional to Gravity Feed Method).

(a)Drain the fuel system as follows :

1 Remove the lockwire and drain plugs for the FP1 and FP3 ports of the fuel pump. Let the fuel drain into a 5 U.S gallon (19 liters) fluid drain container.

(b)If installed, disconnect the main fuel supply line as follows :

1 Remove the four bolts and washers that attach the line to the pump.
2 Disengage the line and remove the gasket.

(c)Replace the fuel pump filter (Ref. 73-12-03, P. Block 401).

(d)Install the PWA 85451 Adapter to the fuel flowmeter as follows :
1 Remove the lockwire and eight bolts that attach the rear fuel flowmeter support. Remove the support.
2 Move the transfer tube rearward into the fuel distribution valve strainer cover. Remove the four bolts and washers that attach the cover to the valve. Remove the cover and transfer tube together as a unit.
3 Install the PWA 85451 Adapter with the gasket and four bolts to the fuel flowmeter outlet.
4 Attach a hose to the adapter. Put the other end in a container with a minimum capacity of 5 U.S gallons (19 liters).

(e)Install the PWA 85433 Adapter with the gasket and four nuts to the fuel pump inlet.

(f)Install the two drain plugs with new packings, lubricated with White Petrolatum (Material No.P06-002). TORQUE the plugs to between 45 and 55 lbf.in. (0.51 and 0.62 m.daN). Safety the plugs with lockwire.

CAUTION : BE SURE THE PRESERVATION CART HAS FILTERS OR STRAINERS OF NO COARSER MESH THAN USED IN THE ENGINE FUEL SYSTEM.

CAUTION : DO NOT SPRAY PRESERVATION OIL (MATERIAL NO.P03-002) INTO THE ENGINE GASPATH. THE OIL CAN CAUSE UNWANTED MATERIAL TO STICK TO THE BLADES AND VANES. REDUCED ENGINE PERFORMANCE CAN RESULT.

CAUTION : MAKE SURE THE ENGINE OIL SYSTEM HAS THE CORRECT AMOUNT OF OIL IN THE SYSTEM OR DAMAGE TO THE ENGINE CAN OCCUR.

(g)Attach the pressure hose of the CTE 3160 Fuel Accessory Preservation Cart Assembly, or equivalent to the PWA 85433 Adapter on the fuel pump inlet port.

(h)Make sure the preservation cart is away from the engine inlet, exhaust and fan discharge area(s).

R (j)Use the cart and flush Lubricating Oil (Material No.P03-002), at a pressure of 5 to 25 psi (34.5 to 172.4 KPa) and at 60°F (16°C) minimum, and wet motor the engine (Ref. 71-00-00, P. Block 501) until approximately 2 U.S gallons (8 liters) are discharged into the fluid drain container.

R (k)Stop the wet motor and the pump on the Fuel Accessory Preservation Cart and disconnect the cart and let the system drain.

R (l)Remove the adapters and gasket from the rear of the fuel flowmeter and the fuel pump inlet port.

R (m)Connect the main fuel supply line as follows :
1 Install a new gasket and the main fuel supply line flange to the fuel pump port.
2 Install the four bolts and washers. TORQUE the bolts to between 180 and 220 lbf.in. (2.04 and 2.48 m.daN).

R (n)Install the fuel flowmeter transfer tube and rear support as follows :
1 Install two new packings lubricated with White Petrolatum (Material No.P06-002), to the transfer tube. Install the transfer tube to the fuel distribution valve strainer cover.
2 Install a new packing lubricated with White Petrolatum (Material

No.P06-002), to the strainer cover. Install the cover and transfer tube to the fuel distribution valve and attach with the four bolts, lubricated with Engine Oil (Material No.P03-001), and washers. TORQUE the bolts to between 30 and 33 lbf.in. (0.34 and 0.37 m.daN).

3 Slide the transfer tube forward and engage the fuel flowmeter and dowel pin. Place the support in position and align the brackets. Install the eight bolts, lubricated with Engine Oil (Material No.P03-001).

NOTE : Install the drilled head bolts to the front.

4 TORQUE the eight bolts to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).

Safety the eight bolts with lockwire to the front four bolts.

R (p)Write the date and the method of preservation on a tag and attach it to the fuel metering unit.

(5)Fuel System Preservation - Gravity Feed Method to Preserve the Engine Fuel System (For Engines That Will Be Inactive For Over 90 Days) (Optional to Pressure Feed Method).

(a)Drain the fuel system as follows :

1 Remove the lockwire and drain plugs for the FP1 and FP3 ports of the fuel pump. Let the fuel drain into a 5 U.S gallon (19 liters) fluid drain container.

(b)If installed, disconnect the main fuel supply line as follows :

1 Remove the fours bolts and washers that attach the line to the pump.

2 Disengage the line and remove the gasket.

(c)Replace the fuel pump filter (Ref. 73-12-03, P. Block 401).

(d)Install the PWA 85451 Adapter to the fuel flowmeter as follows :

1 Remove the lockwire and eight bolts that attach the rear fuel flowmeter support. Remove the support.

2 Move the transfer tube rearward into the fuel distribution valve strainer cover. Remove the four bolts and washers that attach the cover to the valve. Remove the cover and transfer tube together as a unit.

(e)Install the PWA 85451 Adapter with the gasket and four bolts to the fuel flowmeter outlet.

(f)Attach a hose to the adapter. Put the other end in a container with a minimum capacity of 5 U.S gallons (19 liters).

(g)Install the PWA 85433 Adapter with the gasket and four nuts to the fuel pump inlet.

(h)Install the two drain plugs with new packings, lubricated with White Petrolatum (Material No.P06-002). TORQUE the plugs to between 45 and 55 lbf.in. (0.51 and 0.62 m.daN). Safety the plugs with lockwire.

CAUTION : DO NOT SPRAY PRESERVATION OIL (MATERIAL NO.P03-002) INTO THE ENGINE GASPATH. THE OIL CAN CAUSE UNWANTED MATERIAL TO STICK TO THE BLADES AND VANES. REDUCED ENGINE PERFORMANCE CAN RESULT.

CAUTION : MAKE SURE THE ENGINE OIL SYSTEM HAS THE CORRECT AMOUNT OF OIL IN THE SYSTEM OR DAMAGE TO THE ENGINE CAN OCCUR.

R (j)Use a clean dry tank with a capacity of 5 to 10 U.S gallons (19 to 38 liters) and assemble a gravity feed preservation tank as follows :

1 The tank must be vented and have a fitting at the bottom to attach a valve and hose.

NOTE : The hose must be 0.5 inch (12.70 mm) inside diameter (ID) minimum, approximately 20 feet (6.10 m) in length, and must not collapse under negative pressure.

2 Install a shutoff valve to the bottom of the tank with an in-line 40 micron filter.

3 Attach the hose to the PWA 85433 Adapter on the fuel pump inlet port.

4 Position the tank away from the engine fan discharge air and 5 ft (1.52 m) minimum above the fuel pump inlet.

5 Shut the valve at the bottom of the tank.

6 Fill the tank with 5 U.S gallons (19 liters) minimum of flushing Oil (Material No.P03-002).

R (k)Open the valve at the bottom of the tank and wet motor the engine (Ref. 71-00-00, P. Block 501) until approximately 2 U.S gallons (8 liters) of flushing oil comes out of the drain adapter and into the fluid drain container.

R (l)Stop the wet motor and close the valve at the bottom of the tank.

R (m)Disconnect the hose and let the fuel system drain.

R (n)Remove the adapters and gasket from the rear of the fuel flowmeter and the fuel pump inlet port.

R (p)Connect the main fuel supply line as follows :

1 Install a new gasket and the main fuel supply line flange to the fuel pump port.

2 Install the four bolts and washers. TORQUE the bolts to between 180 and 220 lbf.in. (2.04 and 2.48 m.daN).

R (q)Install the fuel flowmeter transfer tube and rear support as follows :

1 Install two new packings lubricated with White Petrolatum (Material No.P06-002), to the transfer tube. Install the transfer tube to the fuel distribution valve strainer cover.

2 Install a new packing lubricated with White Petrolatum (Material No.P06-002), to the strainer cover. Install the cover and transfer tube to the fuel distribution valve and attach with the four bolts, lubricated with Engine Oil (Material No.P03-001), and washers. TORQUE the bolts to between 30 and 33 lbf.in. (0.34 and 0.37 m.daN).

3 Slide the transfer tube forward and engage the fuel flowmeter and dowel pin. Place the support in position and align the brackets. Install the eight bolts, lubricated with Engine Oil (Material No.P03-001).

NOTE : Install the drilled head bolts to the front.

4 TORQUE the eight bolts to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).

Safety the eight bolts with lockwire to the front four bolts.

R (r)Write the date and the method of preservation on a tag and attach it to the fuel metering unit.

R (s)If engine is on wing, use Method II.

NOTE : Every 60 days, examine the humidity indicators of preserved engine whether the engine is stored outside or inside. If relative humidity is more than 40 percent engine should be depreserved and represerved by paragraph G.
Engines that are not more than the humidity limits can begin an additional 60 days storage allowance. Upon completion of the preservation period, re-service the oil system.

F. Preserve the gearboxes, as Follows :

CAUTION : DO NOT PERMIT HYDRAULIC FLUID TO STAY ON THE MAIN GEARBOX DURING THE PRESERVATION TIME. THE HYDRAULIC FLUID CAN CAUSE CORROSION AND DAMAGE TO THE GEARBOX HOUSING.

(1)Examine the gearbox for hydraulic fluid on the gearbox housing. If you see the hydraulic fluid, you must remove it from the housing.

(2)If necessary, use a rag and clean the housing by SPOP 1 Degreasing Of Engine Externals or by SPOP 208 Degreasing of Parts By Solvent Wiping (Ref. 70-00-00, P. Block 201).

(3)If any of the accessories are removed from the main gearbox housing, spray Engine Oil (Material No.P03-001) on the gearbox drive pads.

(4)Install accessory gearbox covers on the gearbox.

G. Preserve the Engine for Relative Humidity, as follows :

NOTE : The relative humidity must be 40 percent or less inside the engine during the preservation time for optimal corrosion prevention.

(1)Install the dehydrating agent, as follows :

(a)Put 25 to 125 pounds (11.34 to 56.70 Kg) of dehydrating agent in the engine. Put one half in the inlet area and the other half in the tail pipe area.

(b)Hang the dehydrating agent in all areas so that the agent does not touch the engine parts.

(c)Put relative humidity indicators inside the inlet and exhaust areas.

(2)Seal the engine for storage, as follows :

(a)Seal all the engine openings. Install a tarp or PVC plastic sheet over the intake cowl, fan exhaust area and the engine exhaust area.

(b)The protective covers must have windows so that you can see the relative humidity indicators inside the engine.

(3)Make a record of the engine preservation method and the date for each engine. Include the procedures used for the oil (oil drained) and the fuel systems (flushing oil).

(4)Examine the engine during preservation, as follows :

(a)Every 15 days or less, examine the humidity indicators.

(b)If the relative humidity is less than 40 percent, change the dehydrating agent, if necessary, and permit the engine to continue in storage for 15 more days. Do not do steps (c) and (d).

(c)If the relative humidity is more than 40 percent, but less than 60 percent replace the dehydrating agent and continue in storage for 15 more days.

(d)If the relative humidity is more than 60 percent, replace the dehydrating and do the following :

1 If no lines in the fuel system were disconnected during the preservation period, re-preserve the oil system only. See Paragraphs D.(1)(a) and (b) of this procedure.

2 If the lines in the fuel system were disconnected during the preservation period, re-preserve both the fuel and oil systems. See Paragraphs E.(1) through (5) of this procedure.

H. Close-up

(1)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301)

and remove safety clips and tags and close circuit breakers.

25. Accomplish Engine Depreservation

A. Equipment and Materials

R	ITEM	DESIGNATION
	Referenced Procedures	
	- 12-13-79, P. Block 001	Engines (Engine Oil System)
	- 70-00-00, P. Block 201	Engine - Standard Practicies
	- 71-00-00, P. Block 201	Power Plant - General - Maintenance Practices
	- 71-13-00, P. Block 301	Cowl Doors

B. General
(1) This task gives the instructions to put the engine back in service after preservation.
(2) To depreserve an engine that was preserved for more than 60 days, it will be necessary to run the engine in a test cell.
(3) For general depreservation procedures, refer to SPOP 428 (Ref. 70-00-00, P. Block 201).
(a) Refer to the method shown for "Depreservation of the engine for engines preserved for 60 days or less (Method I)".
(b) Refer to the method shown for "Depreservation of the engine for engines preserved for more than 60 days (Method II)".

C. Job Set-Up
(1) Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

D. Depreservation Procedure For Engines That Were Preserved For 60 Days Or Less
(1) Remove all covers, tarps or PVC plastic sheets from the engine intake and exhaust area.
(2) Depreserve the main gearbox as follows :
(a) Examine the main gearbox for corrosion damage from hydraulic fluid.
(b) If necessary, repair any hydraulic fluid leaks.
(c) If necessary, remove hydraulic pump and check for hydraulic fluid in gearbox cavity. If evidence of fluid is found, replace gearbox carbon seal.
(d) If any gearbox accessories have been removed, do the steps that follow :
1 Remove the covers on the gearbox drive pads.
2 Install the gearbox accessories.
(3) Fill the engine oil system (Ref. 12-13-79, P. Block 001).

E. Depreservation Procedure For Engine That Were Preserved For More Than 60 Days
(1) Remove all covers, tarps or PVC plastic sheets from the engine intake and exhaust area.
(2) Remove all dehydrating agents from inside the engine.

(3)Depreserve the main gearbox as follows :
(a)Examine the main gearbox for corrosion damage from hydraulic fluid.
(b)If necessary, repair any hydraulic fluid leaks.
(c)If necessary, remove hydraulic pump and check for hydraulic fluid in gearbox cavity. If evidence of fluid is found, replace gearbox carbon seal.
(d)If any gearbox accessories have been removed, do the steps that follow :
1 Remove the covers on the gearbox drive pads.
2 Install the gearbox accessories.
(4)Fill the engine oil system (Ref. 12-13-79, P. Block 001).
(5)Prime Engine Oil And Fuel Systems (Ref. 71-00-00, P. Block 201).
(6)Start the engine by Engine Starting Procedures (Normal) (Ref. 71-00-00, P. Block 201).
(a)Operate the engine at idle power to burn off the remaining flushing oil in the fuel system.
(b)Check the fuel and oil systems for leaks.
(7)Do an engine shutdown by the Engine Shutdown Procedure (Ref. 71-00-00, P. Block 201).
(8)Do all the other depreservation steps shown in SPOP 428 for engines preserved for more than 60 days.

F. Close-Up
(1)Close thrust reverser and fan cowl doors (Ref. 71-00-00, P. Block 301) and remove safety clips and tags and close circuit breakers.

26.Flexible Tubes Visual Inspection - Engine External Tubes

A. Equipment and Materials

R	ITEM	DESIGNATION
	(1)	Circuit Breaker Safety Clips
	Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure
CAUTION : BE CAREFUL WHEN YOU HANDLE, REMOVE OR INSTALL ALL TUBES WHICH CONTAIN A FLEX DESIGN SEGMENT. REMOVE AND INSTALL A TUBE WITH A FLEX SEGMENT WITH THE SAME PRECAUTIONS USED FOR A TUBE WITHOUT A FLEX SEGMENT. DO NOT BEND THE FLEXHOSE OF A TUBE TO HELP WITH THE INSTALLATION OR REMOVAL OF AN ATTACHED COMPONENT. IF A FLEX SEGMENT IS BENT TOO MUCH, THIS CAN CAUSE A KINK IN THE EXTERNAL WIRE BRAID AND IN THE INNER POLYTETRAFLUORETHYLENE (PTFE) TUBE AND LEAKS OR TUBE RUPTURE CAN BE THE RESULT.
(1)Visually examine the flexible tube outer fire sleeve for cuts, tears,

gouges and abrasions that go through the thickness of the outer silicone fire sleeve.

(a)Flexible tubes with cuts or tears to 0.750 in. (19.050 mm) maximum length must be repaired.

(b)Flexible tubes with gouges or abrasions to 0.250 sq.in. (161 sq.mm) maximum area must be repaired.

(c)Flexible tubes with damage that are more than the above limits are not repairable and must not be installed on an engine.

(2)If the outer fire sleeve is damaged, visually examine the fiberglass braid under the silicone fire sleeve.

(a)Visually examine the fiberglass braid for cuts, fraying or punctures.

(b)For tubes assemblies with fire sleeves that are not integral to the flexible section, the outer fire sleeve must not be repaired. These assemblies must not be installed on an engine.

(c)For assemblies with fire sleeves that are integral to the flexible section, the outer fire sleeve is not repairable. These assemblies must not be installed on an engine.

CAUTION : BE CAREFUL WHEN YOU HANDLE, REMOVE OR INSTALL ALL TUBES WHICH CONTAIN A FLEX DESIGN SEGMENT. REMOVE AND INSTALL A TUBE WITH A FLEX SEGMENT WITH THE SAME PRECAUTIONS USED FOR A TUBE WITHOUT A FLEX SEGMENT. DO NOT BEND THE FLEXHOSE OF A TUBE TO HELP WITH THE INSTALLATION OR REMOVAL OF AN ATTACHED COMPONENT. IF A FLEX SEGMENT IS BENT TOO MUCH, THIS CAN CAUSE A KINK IN THE EXTERNAL WIRE BRAID AND IN THE INNER POLYTETRAFLUORETHYLENE (PTFE) TUBE AND LEAKS OR TUBE RUPTURE CAN BE THE RESULT.

(3)Visually examine the flexible tube assemblies without fire sleeves or assemblies on which the fire sleeve has been removed.

(a)Visually examine the stainless steel braid for kinks, broken wires, frayed areas or corrosion. Use a 5X magnification or greater.

(b)Flexible tube assemblies with damage specified above must not be installed on an engine.

CAUTION : BE CAREFUL WHEN YOU HANDLE, REMOVE OR INSTALL ALL TUBES WHICH CONTAIN A FLEX DESIGN SEGMENT. REMOVE AND INSTALL A TUBE WITH A FLEX SEGMENT WITH THE SAME PRECAUTIONS USED FOR A TUBE WITHOUT A FLEX SEGMENT. DO NOT BEND THE FLEXHOSE OF A TUBE TO HELP WITH THE INSTALLATION OR REMOVAL OF AN ATTACHED COMPONENT. IF A FLEX SEGMENT IS BENT TOO MUCH, THIS CAN CAUSE A KINK IN THE EXTERNAL WIRE BRAID AND IN THE INNER POLYTETRAFLUORETHYLENE (PTFE) TUBE AND LEAKS OR TUBE RUPTURE CAN BE THE RESULT.

(4)Visually examine the flexible tube assemblies with fire sleeves in place.

(a)Visually examine the fire sleeve for wires that come out of the braid or distortion that shows the braid damage under the fire sleeve.

(b)Visually examine the tube assemblies with integral fire sleeves for flat or discolored areas. This will show a kinked tube.

(c)Use care when you feel for wires that come out of the braid. Use your fingers to feel the fire sleeve for necking under the stainless braid. This will show a kinked tube.

(d)Flexible tube assemblies with the damage specified above must not be installed on an engine.

(e)Flexible tubes with a slip-on fire sleeve that has a loose metal strap

on each end of the tube must not be installed on an engine.

(5)Visually examine the flexible tube inner diameter for kinks.

(a)Get a round ball that has an 80 percent minimum diameter of the inner diameter of the flexible tube.

(b)Put the ball through one end of the tube. The ball must come out the other end.

(c)Flexible tube assemblies with the damage specified above must not be installed on an engine.

D. Pressure Check Flexible Tubing

(1)For fuel hydraulic fluid flexible hoses, do a pressure test of all not installed or removed lines with water or equivalent fluid at 1150 - 1200 psi (7929.0 - 8273.7 kPa) for three minutes and check for leaks.

(2)For oil and air flexible hoses, do a pressure check with water or equivalent fluid at 195 - 200 psi (1344.5 - 1379.0 kPa) for three minutes and check for leaks.

(3)If you find a leak, do not install on an engine.

E. Close-Up

(1)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301) and remove safety clips and tags and close circuit breakers.

1. Clean Engine Gaspath (Water Wash With or Without Detergent) for Performance Improvement

A. Equipment and Materials

	ITEM	DESIGNATION
	(1)Material No.P05-005	Special Materials (Ref. 70-00-00)
	(2)Material No.P05-068	Special Materials (Ref. 70-00-00)
	(3)Material No.P05-252	Special Materials (Ref. 70-00-00)
	(4)Material No.P05-289	Special Materials (Ref. 70-00-00)
	(5)Material No.P05-291	Special Materials (Ref. 70-00-00)
	(6)Material No.P05-292	Special Materials (Ref. 70-00-00)
	(7)Material No.P11-014	Cleaning Agents (Ref. 70-00-00)
R	(8)Material No.P11-049	Cleaning Agents (Ref. 70-00-00)
R	(9)PWA83298	Valve (with necessary hoses to give 15 US gallons (57 liters) per minute flow)
R	10)PWA86516	Basic Cart with Gasoline Powered Pump
	or	
R	11)PWA86517	Basic Cart with Electric Powered Pump
	or	
R	12)PWA86527	Basic Cart with Gasoline Powered Pump and Nitrogen Supply System
	or	
R	13)PWA86528	Basic Cart with Electric Powered Pump and Nitrogen Supply System
	or	
R	14)PWA101041	Water Wash Nozzle (2 Necessary)
	Referenced Procedures	
	- 70-00-00, P. Block 201	Engine - Standard Practices
	- 71-00-00, P. Block 201	Power Plant - General
	- 71-00-00, P. Block 501	Power Plant - General
	- 71-13-00, P. Block 301	Cowl Doors
	- 73-21-01, P. Block 601	Full Authority Digital Engine Control
	- 75-24-14, P. Block 601	Filter Turbine Vane and Blade Cooling Air Valve
	- 77-31-06, P. Block 601	Propulsion Multiplexer Unit (PMUX)

B. Equipment

R CAUTION : (REF. 70-00-00, P. BLOCK 201, SPOP 425) FOR ENGINES THAT HAVE
R BEEN EXPOSED TO FIRE EXTINGUISHING AGENTS, HYDRAULIC FLUID,
R OIL OR FUEL.

(1)Hoses and nozzles to provide water flow capacity of approximately 160 gals/min. (605.67 liter/min.). Experience has shown that two 0.875 in. (22.225 mm) nozzles with appropriate size hoses and supply pressure will provide this flow.

(2)Potable water (Ref. 70-00-00, P. Block 201) source at 7.5 gal/min (28.39 liter/min) with PWA 101041 wash nozzle. Use existing potable water from tap or substitute suitable tank and pump.

(3)Clean shop air or nitrogen or basic cart with pump (Ref. Equipment and Materials table).

C. Procedure

R

CAUTION : TO PREVENT THE FORMATION OF ICE, WATER WASH SHOULD NOT BE DONE WHEN AMBIENT TEMPERATURE IS LESS THAN 40°F (4.4°C) UNLESS YOU ADD ALCOHOL TYPE ANTIFREEZE TO THE WATER.

CAUTION : DO NOT DO THIS PROCEDURE ON BOTH ENGINES DURING THE SAME MAINTENANCE VISIT.

NOTE : Use your previous experience to determine if you use detergent to wash the engine gaspath.

(1)To prevent the formation of ice, do not do this water wash procedure when the ambient temperature is less than 40°F (4.4°C) unless you add Isopropyl Alcohol (Material No.PO11-014) to the water.

R (2)(Optional) Collect a Pre water wash oil sample.

R (a)Use a clear drain bottle, glass jar, or equivalent to collect a 4 ounce (100 ml) sample of oil.

R (b)Collect a sample from a low point on the engine.

R (c)Label the sample, "Pre water wash".

R (3)Calibrate and install the wash equipment as follows (Ref. Fig. 701) :

(a)Connect the hoses, adapters, PWA83298 valve, and the two PWA101041 wash nozzles to the water source.

(b)Turn on the water source.

(c)Adjust the PWA83298 flow valve for approximately 15 US gallons (57 liters) per minute total flow (7.5 US gallons (28.5 liters) per minute from each nozzle).

NOTE : Use a container of known volume and a stop watch to calculate the flow rate.

(d)Make a mark on the valve and valve handle for the correct position.

(e)Turn off the source.

R (4)Install the equipment to the engine as follows :

(a)Use two persons and carefully insert the PWA101041 wash nozzles from the rear of the thrust reverser fan exit area at approximately the 3 and 9 o'clock positions.

(b)Put the nozzles over the forward lip of the fan exit fairing (spliter) just aft of the fan blades.

(c)Make sure the flow will go into the engine core gaspath at approximately the 3 and 9 o'clock positions.

(d)Put the nozzles in position as not to touch the fan exit guide vanes.

(e)Carefully, attach the nozzle hooks to the thrust reverser translating cowl as follows :
(Ref. Fig. 703)

1 Pull the hook handle aft.

2 Engage the hook over the aft edge of the thrust reverser translating cowl to hold the wash nozzle in position.

3 Check that the four detail bolts on the clamp assembly are tight to hold the clamp in the correct position.

4 Attach the hoses and the valve to some adjacent structure so that they do not move during the washing and rinsing procedure.

R (5)Examine the equipment installation as follows (Ref. Fig. 702)
(a)If necessary, change the position of the wash nozzles for better attachment.
(b)Make sure there is enough clearance between the nozzles and the LPC 1st Stage fan blades for safe engine motoring.
(c)Make sure there is enough clearance between the nozzles and the LPC 1.6 stage blades for safe engine motoring.
(d)Make sure you can turn the low pressure compressor (LPC) freely.
(e)Make sure the hose and valve are not in the fan airstream and are correctly attached before you motor the engine with the starter.
(f)Make sure the hoses and valve are correctly attached to an adjacent structure so that they are not able to move during the washing and rinsing.

R (6)For optional water wash with cleaning solution, prepare 30 US gallons
R (113.56 liters) of gaspath/compressor cleaner solution (Ref. 70-00-00,
R P. Block 201).
(a)The solution must be completely mixed and you must start the water wash within one hour after you mix the solution.

R (7)For outside ambient temperatures less than 40°F (4.4°C), mix Isopropyl Alcohol (Material No.P11-014) to the water as follows :

Percent Alcohol By Volume	Outside Air Temperature (OAT)
5	39°F (3.9°C)
9	36°F (2.7°C)
14	33°F (0.6°C)
17	31°F (-0.6°C)
20	28°F (-2.2°C)
22	26°F (-3.3°C)
23	25°F (-3.9°C)
27	20°F (-6.7°C)
32	15°F (-9.4°C)
36	10°F (-12.2°C)
39	5°F (-15°C)
43	0°F (-17.8°C)

Minimum Required Alcohol/Water Mixtures
Table 701

NOTE : At 40°F (4.4°C) and below, be careful when you do the water wash. Make sure no ice forms which could cause damage to the engine. Use Table 701 for the correct mixture.

R (8)(Optional) Measure the Pre water wash oil quantity.
R (a)Dry motor the engine with the starter in order to get an oil quantity
R measurement check before you do the water flow into the engine.
R (b)Motor the engine for at least 30 seconds and then make a record of the
R oil quantity measurement and %N2 speed during the dry motor procedure.

R (9)Dry motor the engine with the starter until 18-22 percent N2 is reached. Keep N2 in this range during the washing and rinsing procedure (Ref. 71-00-00, P. Block 501).
NOTE : The engine RPM will decrease as water flows into the gaspath.
CAUTION : DO NOT START THE WATER FLOW INTO THE GASPATH IF EGT IS ABOVE

150°F (66°C).

R IF YOU START THE WATER FLOW WITH THE EGT ABOVE 150°F (66°C) THE
R WATER WILL EVAPORATE FROM THE HOT SURFACES AND WILL NOT EFFEC-
R TIVELY CLEAN THE SURFACE.

R (10)With the EGT less than 150°F (66°C) start the flow of water (or solution) into the gaspath at approximately 15 US gallons (57 liters) total flow.

R (11)After approximately 45 seconds, stop the water flow and stop the engine motoring.

R CAUTION : IF YOU CONTINUE TO FLOW THE WATER WHILE THE ENGINE IS NOT
R MOTORING, IT WILL INCREASE THE RISK OF WATER CONTAMINATION OF
R THE OIL SYSTEM, WHICH CAN SUBSEQUENTLY REQUIRE THE OIL SYSTEM
R TO BE DRAINED BY STEP (28)(e).

R (12)Wait approximately 5 minutes.

R (13)Do this wash procedure 3 times.

NOTE : If water flow from the trail pipe is dirty, benefit can be increased if you do the wash procedure again. The operator can do the wash procedure again at their discretion.

R (14)If you used detergent cleaning solution, do the wash procedure 2 more times with water only.

NOTE : This is necessary to rinse all the detergent from the gaspath. The engine RPM will decrease as water flows into the gaspath.

CAUTION : REMOVE THE WATER WASH EQUIPMENT AS SOON AS POSSIBLE AND BEFORE YOU OPEN THE THRUST REVERSER. IF YOU TRY TO OPEN THE THRUST REVERSER WITH THE EQUIPMENT INSTALLED, YOU WILL CAUSE DAMAGE TO THE ENGINE AND/OR THRUST REVERSER.

R (15)Remove the wash nozzles from the engine as follows :
(a)Remove hoses, adapters, and valve.
(b)Loosen the four bolts on the clamp assembly.
(c)Pull the hook handles aft.
(d)Carefully remove the wash hooks.

R (16)Examine the LPC 1st stage (fan) blades, fairing, fan exit guide vanes and 1.6 stage blades for any damage from the cleaning procedure.

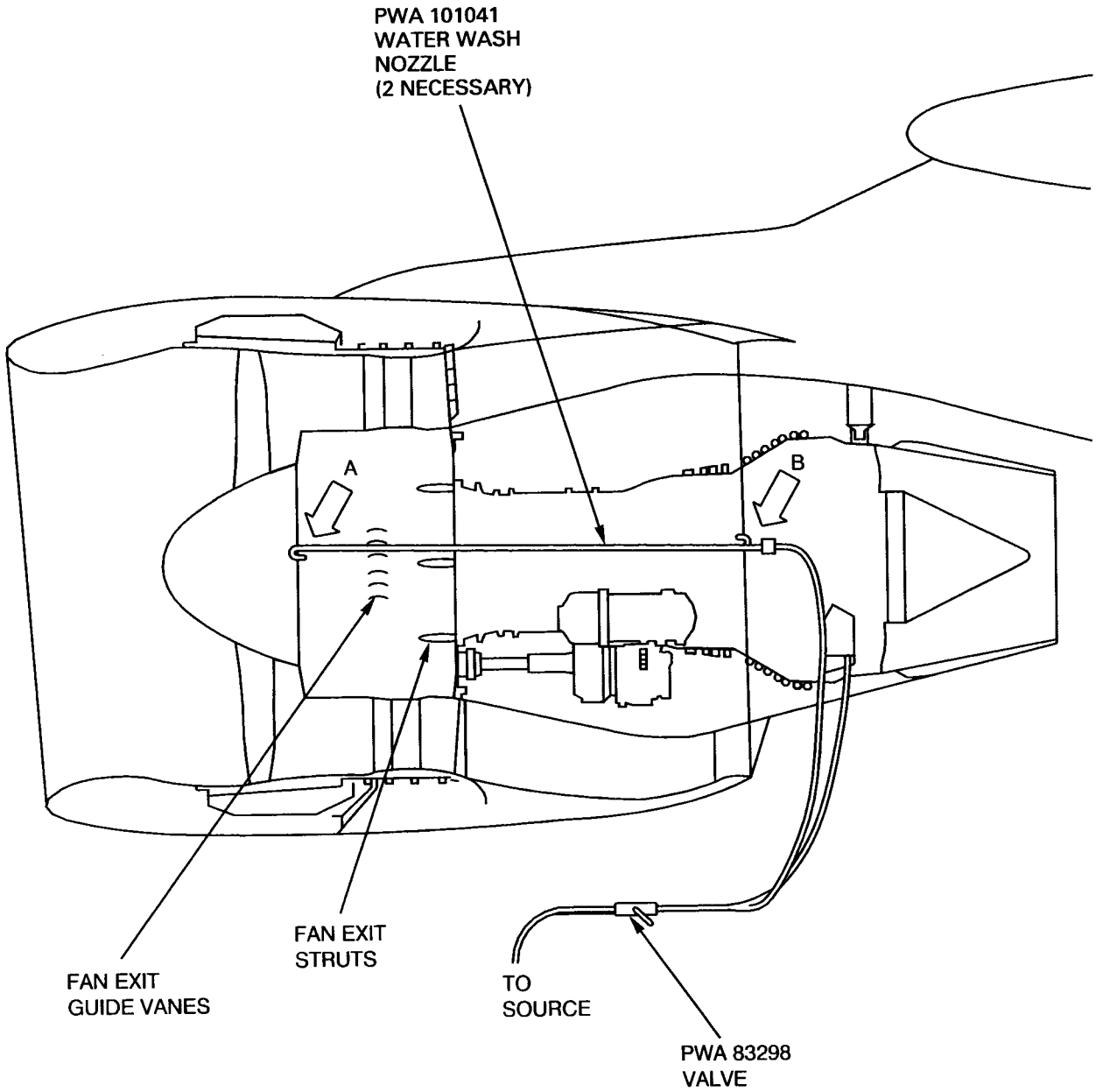
R (17)Hand wash LPC 1st stage (fan) blades by one of the methods that follows:
R (a)Make a clean Lint Free Cotton Cloth (Material No.P05-005) or fine or
R medium Scotch Brite Pad (Material No.P05-252) moist with SPS 87 Gaspath
R Cleaner Solution. Wipe both sides of the fan blades (as possible) until
R clean. See 70-00-00, P. Block 201 for SPS 87 make-up. Rinse the blades
R thoroughly with clean water.
R (b)Wipe the blades with SPMC 148 Wipe Cleaner (Material No.P11-049) on a
R clean cloth. A Tampico or nylon brush can be used to scrub the fan
R blades. Wipe off with a clean cloth. Rinse is not necessary.

R (18)Hand wash the Stage 1 LPC stator vanes with SPMC 148 Wipe Cleaner
R (Material No.P11-049) on a clean cloth. A Tampico or nylon brush can be
R used to scrub LPC stator vanes. Wipe off with a clean cloth. Rinse is not
R necessary.

CAUTION : MAKE SURE YOU REMOVE THE WATER WASH EQUIPMENT BEFORE YOU OPEN THE THRUST REVERSER. IF YOU TRY TO OPEN THE THRUST REVERSER WITH THE EQUIPMENT INSTALLED, YOU WILL CAUSE DAMAGE TO THE ENGINE AND/OR THRUST REVERSER.

R (19)Open the right and left fan cowl doors (Ref. 71-13-00, P. Block 301).

R (20)Do an inspection and drain the P2, PAMB, PB, and P4.95 condensation



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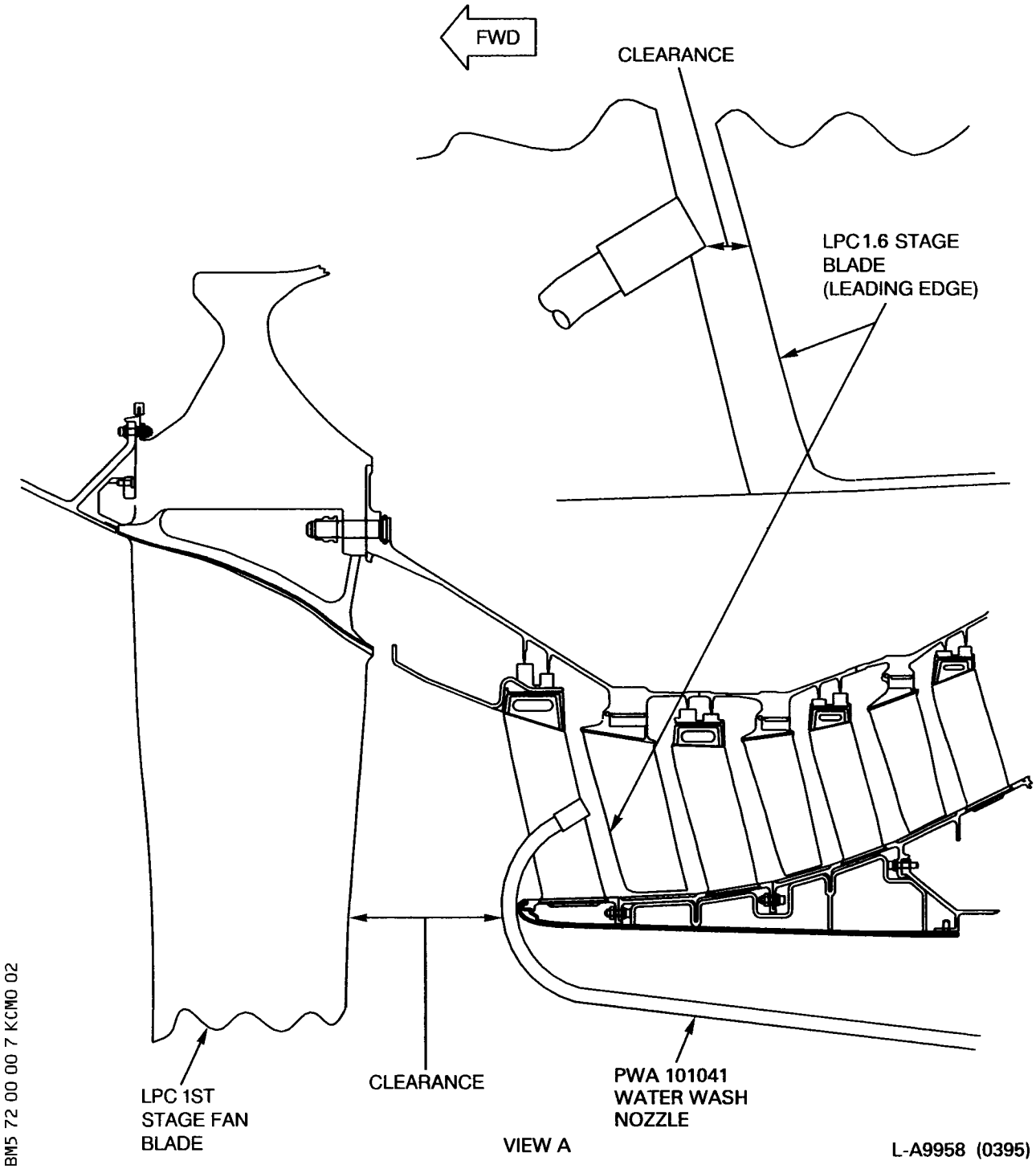
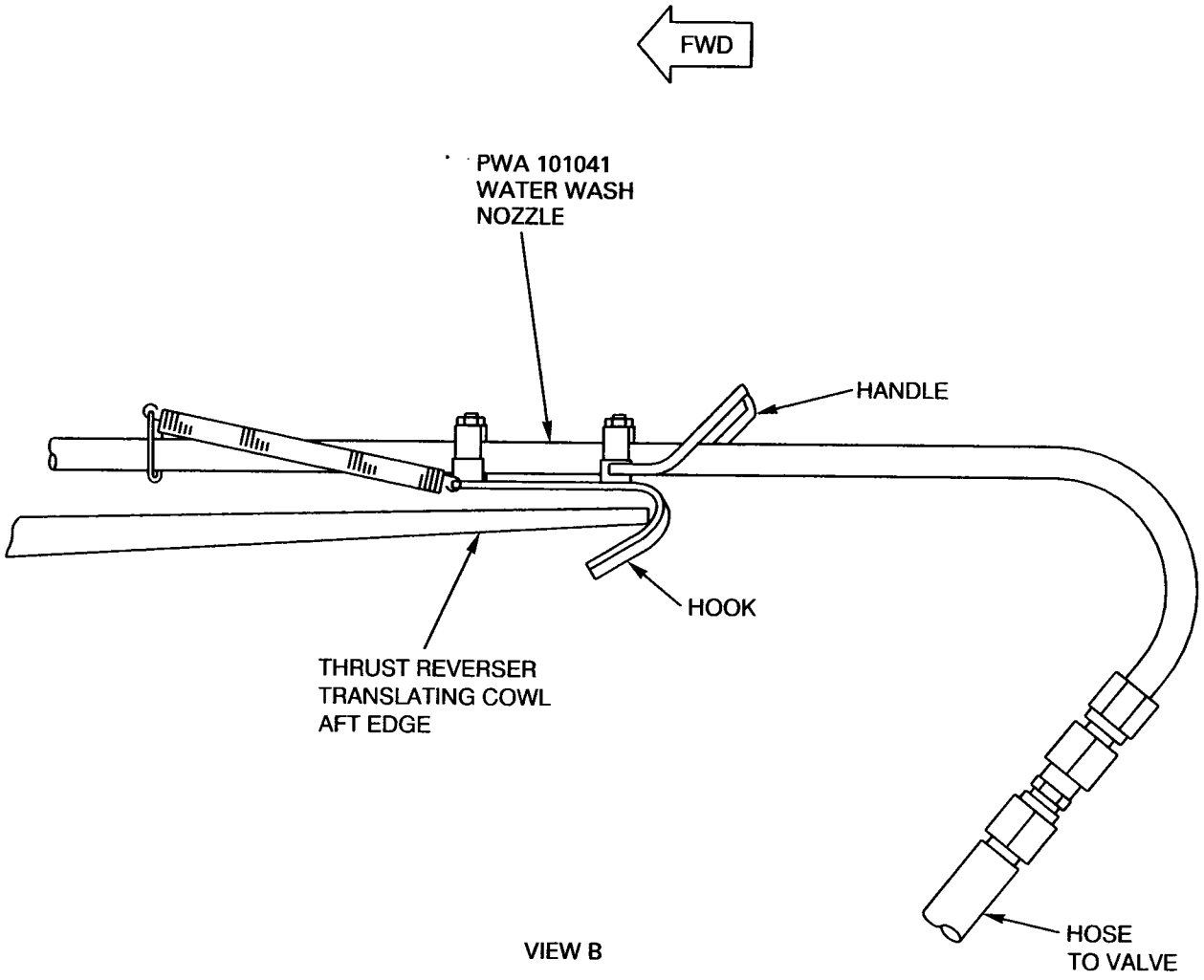
Water Wash Equipment Installation
Figure 701



Water Wash Equipment Installation
Figure 702



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L-A9959 (0595)

Water Wash Equipment Installation
Figure 703

traps (Ref. 73-21-01, P. Block 601).

R (21)Do an inspection and drain the SCU P2.5 condensation trap.

R (22)Remove any water from the FADEC sensing system by the steps that follow.

(a)Hold the adapters with a wrench and disconnect the sensing P2, PAMB P4.95, and PB hoses from the FADEC and the sensing P2.5 hose from the SCU.

(b)Install the necessary adapters and fittings to attach shop air or Nitrogen Gas (Material No.P05-068) to each sensing hose.

CAUTION : DO NOT PUT PRESSURE INTO THE FADEC OR SCU. IF YOU DO, YOU CAN CAUSE DAMAGE TO THE FADEC OR SCU.

(c)Use 20 psi (1.38 bars) shop air or Nitrogen Gas (Material No.P05-068) and remove any water from each sensing system.

(d)Remove the adapters and fittings.

CAUTION : DO NOT USE LUBRICANTS ON FADEC, OR SCU SENSING TUBES, ADAPTERS, OR PACKINGS. IF YOU DO, CONTAMINATION CAN OCCUR TO THESE COMPONENTS.

R (23)Connect the FADEC and SCU sensing hoses as follows (Ref. Fig. 704, 705) :

(a)Do not apply lubricant to the hoses or adapters.

(b)Attach the rear PB flex hose (AS12) to the adapter in the port marked PB. Hold the adapter with a wrench and TORQUE the flex hose nut to between 270 and 300 lbf.in. (3.05 and 3.38 m.daN).

1 If the hose nuts have lockwire holes, install the Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the hose nuts.

(c)Attach the P4.95 flex hose (AS13) to the adapter in the port marked P5. Hold the adapter with a wrench and TORQUE the flex hose nut to between 450 and 500 lbf.in. (5.08 and 5.64 m.daN).

1 If the hose nuts have lockwire holes, install the Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the hose nuts.

(d)Attach the PAMB flex hose (AS10) to the adapter in the port marked PAMB. Hold the adapter with a wrench and TORQUE the flex hose nut to between 135 and 150 lbf.in. (1.53 and 1.69 m.daN).

1 If the hose nuts have lockwire holes, install the Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the hose nuts.

(e)Attach the P2 flex hose (AS11) to the adapter marked P2. Hold the adapter with a wrench and TORQUE the flex hose nut to between 90 and 100 lbf.in. (1.02 and 1.12 m.daN).

1 If the hose nuts have lockwire holes, install the Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the hose nuts.

(f)On the SCU, attach the P2.5 flex hose (AS38) to the adapter at the bottom side of the supplemental control unit (Ref. Fig. 706). Hold the adapter with a wrench and TORQUE the flex hose nut to between 270 and 300 lbf.in. (3.05 and 3.38 m.daN).

1 If the hose nuts have lockwire holes, install the Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the hose nuts.

(g)If the hose nuts have lockwire holes, install the Lockwire (Material

No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the PB sensing hose nut, on the FADEC.

CAUTION : ALL ENGINE MONITORING OPENINGS MUST BE FREE OF WATER AND PROTECTION COVERS. IF THESE OPENINGS ARE BLOCKED, DAMAGE TO THE ENGINE CAN OCCUR AND AFFECT THE OPERATION OF THE AIRCRAFT.

R (24)Close the fan cowl doors (Ref. 71-13-00, P. Block 301).

R (25)(Optional) Do a Post water wash oil quantity check.

R (a)Dry motor the engine with the starter to get an oil quantity measurement check before you do the water flow into the engine.

R (b)Motor the engine for at least 30 seconds and then make a record of the oil quantity and %N2 speed during this dry motoring procedure.

R NOTE : Oil quantity can vary if %N2 does not agree within +/- 2% of the %N2 speed recorded for the Pre water wash oil quantity check.

R (26)Check the environmental control system for odors as follows.

(a)Start the engine by the engine starting procedure (normal) (Ref. 71-00-00, P. Block 201).

R (b)Run the engine at sufficient power to get a main oil temperature of 220°F (104.4°C) minimum for a minimum of two minutes.

(c)Operate the air conditioning packs and insure there is no odor.

NOTE : If there is odor, continue to operate engine until you do not notice the odor.

(d)Do the engine shutdown procedure (Ref. 71-00-00, P. Block 201).

R (27)(Optional) Collect a Post water wash oil sample.

R (a)Use a clear drain bottle, glass jar, or equivalent to collect a 4 ounce (100 ml) sample of oil.

R (b)Label the container, "Post water wash".

R (28)(Optional) Determine if the oil is suspect for water contamination.

R (a)Compare the oil quantity measured Pre water wash, step (8), to the oil quantity measured Post water wash.

R Post water wash quantity - Pre water wash quantity.

R (b)Compare the Post water wash oil sample to the Pre water wash oil sample.

R 1 Hold the oil samples collected Pre water wash and Post water wash, side by side, and up to a light source.

R 2 Compare the color of the oil samples. Look for a lighter color (potentially milky appearance) in the Post water wash sample, or beading of water within the oil. These indications show that there can be water contamination of the oil system.

R NOTE : If there is no apparent color change between the two samples, examine the Post water wash sample again after 30 minutes. If a separation of oil and water is seen, there is water contamination of the oil system.

R (c)If the oil quantity does not increase by 2 quarts (2 liters) or more, and there is no significant (visual) change in color shading between the Pre and Post water wash samples, the oil can be thought to be free of water contamination.

R 1 Do steps 30 and 31 "Examine the P2.5, PB, and P4.95 condensation traps again".

R (d)If the oil quantity increases by 2 quarts (2 liters) or more, or there is a significant (visual) change in color shading between the Pre and Post water wash samples, the oil can be thought have water contamination.

R 1 If water contamination of the oil is possible because of the increased oil quantity, but the oil sample comparison is in limits, you can take a second oil sample after one more 10 minute Idle run. If the oil is found to be in limits, go on to steps (30) and (31) "Examine the P2.5, PB, and P4.95 condensation traps again".

R (e)For engines that you think have water contamination in the oil system do as follows:

R 1 Drain the engine oil system.

R 2 Re-service the engine oil system.

R (29)(Optional) Perform Test No. 3 "Idle Power Test" to address leakage concerns associated with the method used to obtain the Post water wash oil sample from the low point on the engine.

R (30)Examine the P2, PAMB, PB, and P4.95 condensation traps again (Ref. 73-21-01, P. Block 601).

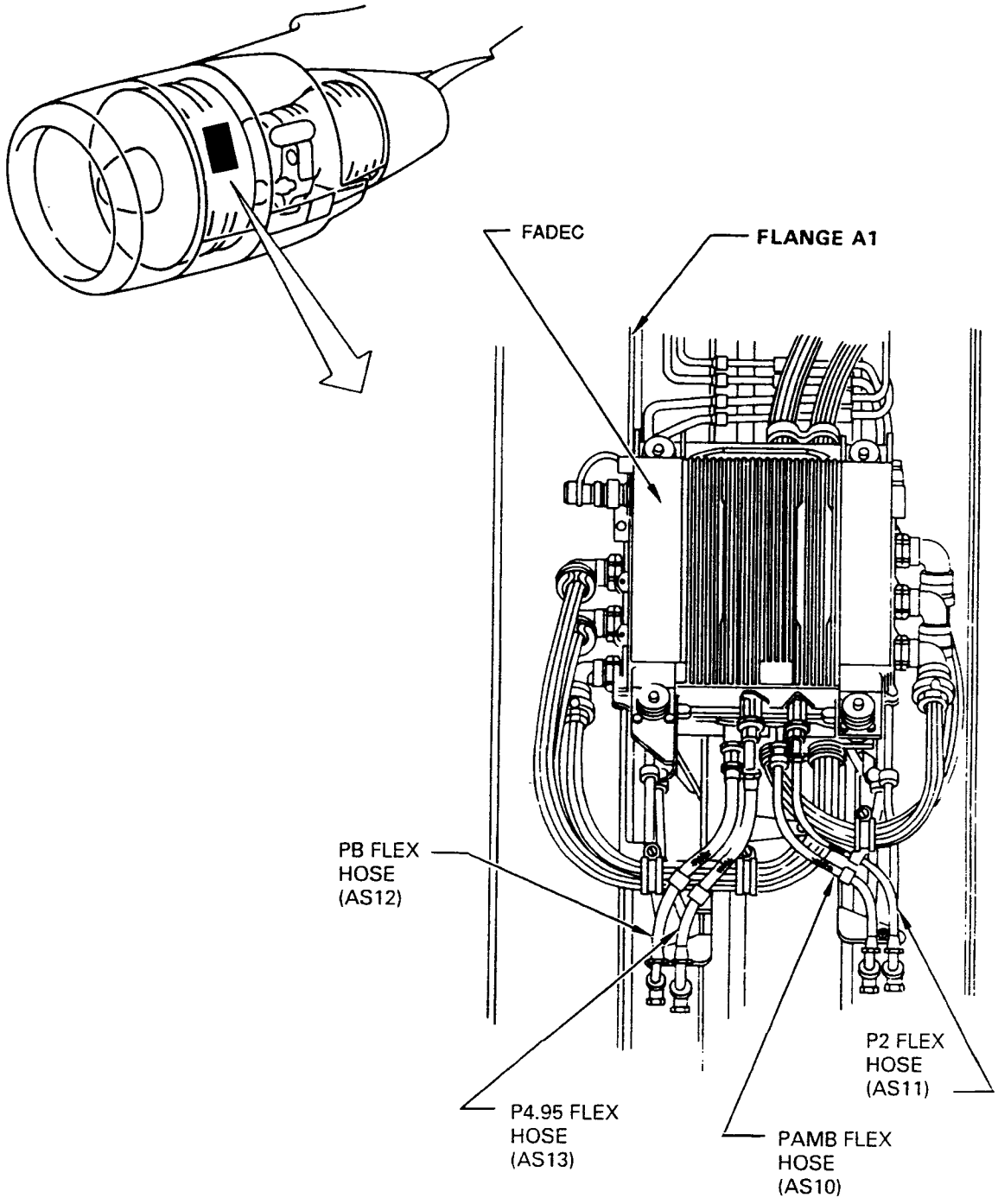
NOTE : You must remove all water from the sense lines before you continue in service.

R (31)Examine the SCU P2.5 condensation trap again.

NOTE : You must remove all water from the sense line before you continue in service.

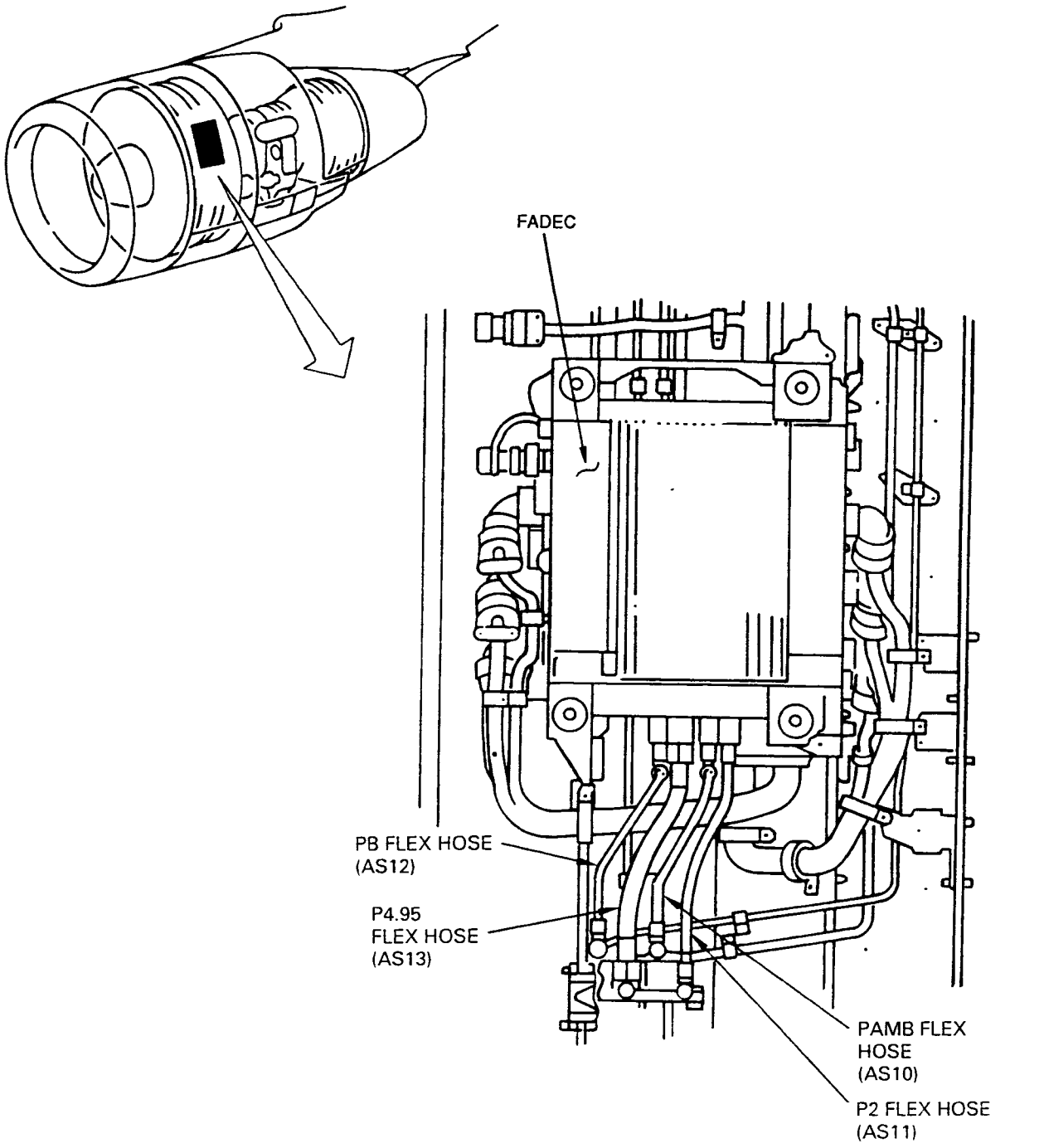
R (32)Do an inspection of the turbine vane and blade cooling air valve air filter elements (Ref. 75-24-14, P. Block 601).

R NOTE : Pratt & Whitney recommends to run the engine as soon as possible
R Post water wash. However, it is acceptable for the engine to sit
R up to 24 hours maximum Post water wash, before engine run.



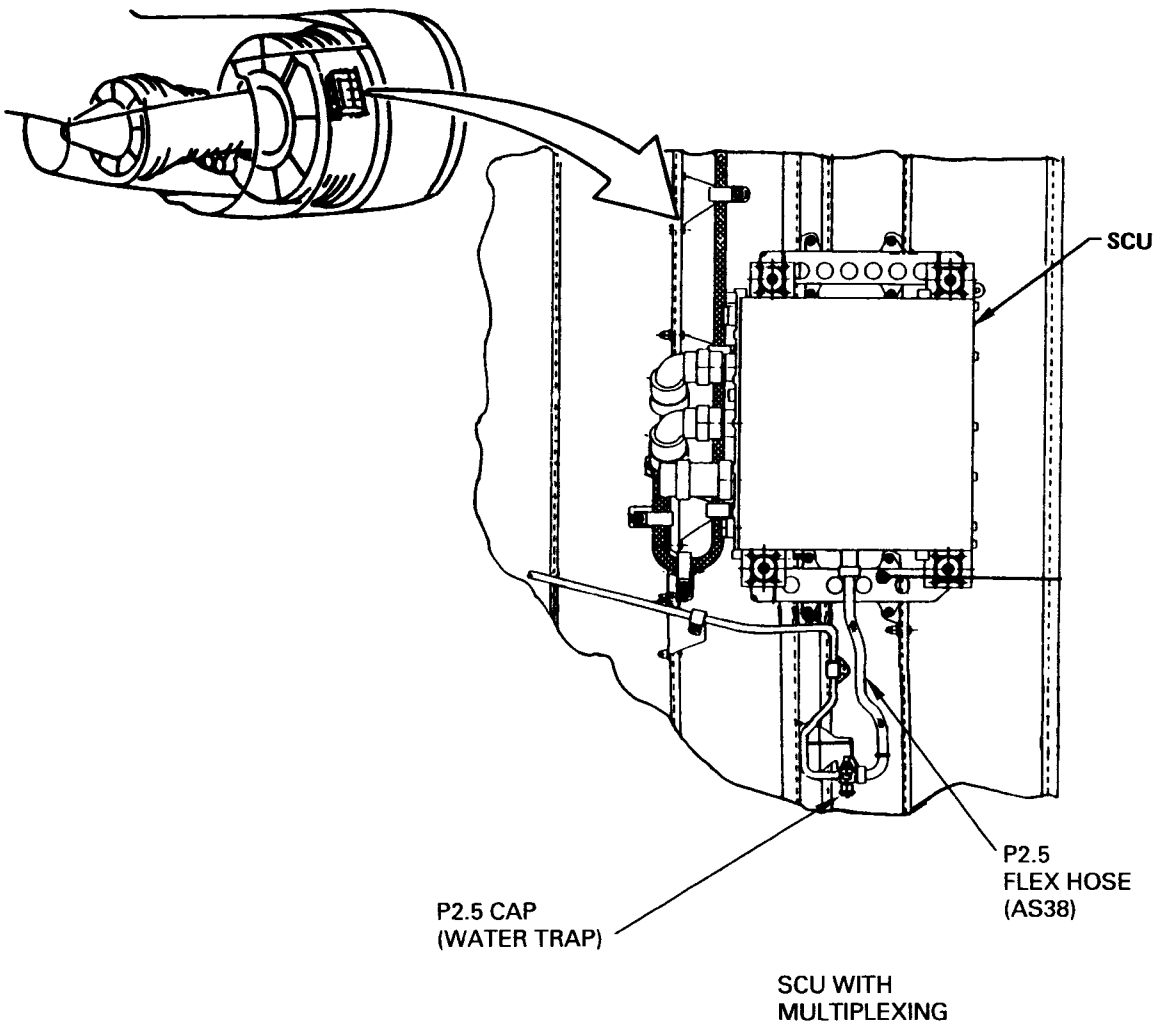
BM5 72 00 00 7 KGM0 00

FADEC Sensing Lines (Basic Configuration)
Figure 704



BM5 72 00 00 7 KLM0 01

FADEC Sensing Lines (New Configuration)
Figure 705



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L-A9994 (0000)

Supplemental Control Unit (with Multiplexing) Sense Line
Figure 706

2. Clean Engine Gaspath After Use of Fire Extinguishing Agents

A. General

This procedure gives direction on how to clean the engine gaspath after chemical contact with fire extinguishing agents.

B. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedure	
- 70-00-00, P. Block 201	Engine - Standard Practices

C. Procedure

(1) If necessary, clean the engine to remove fire extinguishing agents by SPOP 425 (Ref. 70-00-00, P. Block 201).

3. Cleaning of Exhaust Gas Average Pressure (And Thermocouple Housing) PT4.95 Probes (Pressure Sensing Holes)

A. Equipment and Materials

ITEM	DESIGNATION
A.	Bergen Mechanical Crimper (Optional) Model M303, M305 or M307
B. PWA86453	Pump
C. PWA86457	Adapter, Pump (Pre SB PW4 ENG 72-134)
D. PWA86458	Adapter, Pump (Post SB PW4 ENG 72-134)
E. Material No.P05-289	Special Materials (Ref. 70-00-00)
F. Material No.P05-291	Special Materials (Ref. 70-00-00)
G. Material No.P05-292	Special Materials (Ref. 70-00-00)
H. Material No.P11-014	Cleaning Agents (Ref. 70-00-00)
J. Material No.P11-040	Cleaning Agents (Ref. 70-00-00)
K. Material No.P11-041	Cleaning Agents (Ref. 70-00-00)

B. Procedure

CAUTION : THE ENGINE MUST BE COOLED DOWN FOR AT LEAST SIX HOURS SINCE THE LAST OPERATION AND EGT MUST BE LESS THAN 175°F (79.4°C). IF THE AIRCRAFT/ENGINE CAN BE SUBJECTED TO FREEZING WEATHER CONDITIONS PRIOR TO THE NEXT OPERATION, MIX ANTIFREEZE WITH THE POTABLE WATER TO KEEP ICE FROM FORMING IN THE EXHAUST CASE. ICE OR FROZEN LIQUIDS IN THE TURBINE EXHAUST CASE CAN CAUSE N1 ROTOR SEIZURE OR POSSIBLE DAMAGE TO THE SIXTH STAGE LOW PRESSURE TURBINE ROTOR.

(1)Under freezing temperature conditions, you must add sufficient Material No.P11-014, to the potable water used in the following step. See Table 701 for the minimum water-alcohol mixture. A maximum mixture of 50 percent alcohol can be used.

Outside Air Temperature (OAT)	Percent Alcohol By Volume
39°F (3.9°C)	5
36°F (2.7°C)	9
33°F (0.6°C)	14
31°F (-0.6°C)	17
28°F (-2.2°C)	20
26°F (-3.3°C)	22
25°F (-3.9°C)	23
20°F (-6.7°C)	27
15°F (-9.4°C)	32
10°F (-12.2°C)	36
5°F (-15°C)	39
0°F (-17.8°C)	43

Minimum Required Alcohol/Water Mixtures
Table 701

NOTE : At 40°F (4.4°C) and below, be careful when you do the water wash. Make sure no ice forms which could cause damage to the engine. Use Table 701 for the correct mixture.

(2)Mix a total of one gallon (3.79 liter) of cleaning solution in the following proportions :
10 percent - Material No.P11-040 or Material No.P11-041
90 percent - Potable water

(3)Remove as many clamps as necessary to move the EEC PT4.95 tube (AS02) away from the EEC PT4.95 manifold (AS03) to install the cleaning adapters specified in the following step.

CAUTION : THE CLEANING ADAPTER MUST BE CONNECTED ONLY TO THE EEC PT4.95 MANIFOLD (AS03) TO AVOID DAMAGE TO THE ELECTRONIC ENGINE CONTROL.

(4)Install cleaning adapter to the EEC PT4.95 manifold.
(a)(Pre SB PW4 ENG 72-134). Install PWA86457 Adapter to the EEC PT4.95 manifold (Ref. Fig. 707).
(b)(Post SB PW4 ENG 72-134). Install PWA86458 Adapter to the EEC PT4.95 manifold (Ref. Fig. 707).
(c)(Post SB PW4ENG 79-76) Install PWA86458 Adapter to the EEC PT4.95 manifold (Ref. Fig. 708).

(5)Attach the PWA86453 Pump to the adapter on the EEC PT4.95 manifold (AS03) with the hose that is part of the pump.

(6)Connect the PWA86453 Pump to a shop air source and to a container of cleaning solution.

(7)To prevent the dispensed cleaning solution from draining on the ground or area under the engine, place a container with a minimum capacity of 2 gallons (7.57 liters) under the engine directly under Flange P, between the low pressure turbine and the exhaust case.

(8)Set the inlet air pressure to the PWA86453 Pump to between 75 and 105 psig (517.1 and 723.9 kPa), and flow 1 gallon (3.79 liters) of cleaning solution through the PT4.95 manifold and the PT4.95 probes.

NOTE : The liquid will discharge directly into the gaspath area of the turbine exhaust case duct. It is also expected that the liquid will leak through Flange P under the engine.

CAUTION : IF THE AIRCRAFT/ENGINE CAN BE SUBJECTED TO FREEZING WEATHER CONDITIONS PRIOR TO THE NEXT OPERATION, MIX ANTIFREEZE WITH THE POTABLE WATER TO KEEP ICE FROM FORMING IN THE EXHAUST CASE. ICE OR FROZEN LIQUIDS IN THE TURBINE EXHAUST CASE CAN CAUSE N1 ROTOR SEIZURE OR POSSIBLE DAMAGE TO THE SIXTH STAGE LOW PRESSURE TURBINE ROTOR.

(9)Set the inlet air pressure to the PWA86453 Pump to between 75 and 105 psig (517.1 and 723.9 kPa) and flow 1 gallon (3.79 liters) of potable water through the PT4.95 manifold and PT4.95 probes.

(10)Disconnect the pump at the quick disconnect fitting and attach a source of dry compressed air. Flow the compressed air at 75 - 105 psig (517.1 - 723.9 kPa) for two minutes through the EEC PT4.95 manifold (AS03) and the probes.

(11)Remove the adapter from the manifold.

(12)Connect the EEC PT4.95 tube (AS02) to the EEC PT4.95 manifold (AS03) as follows :

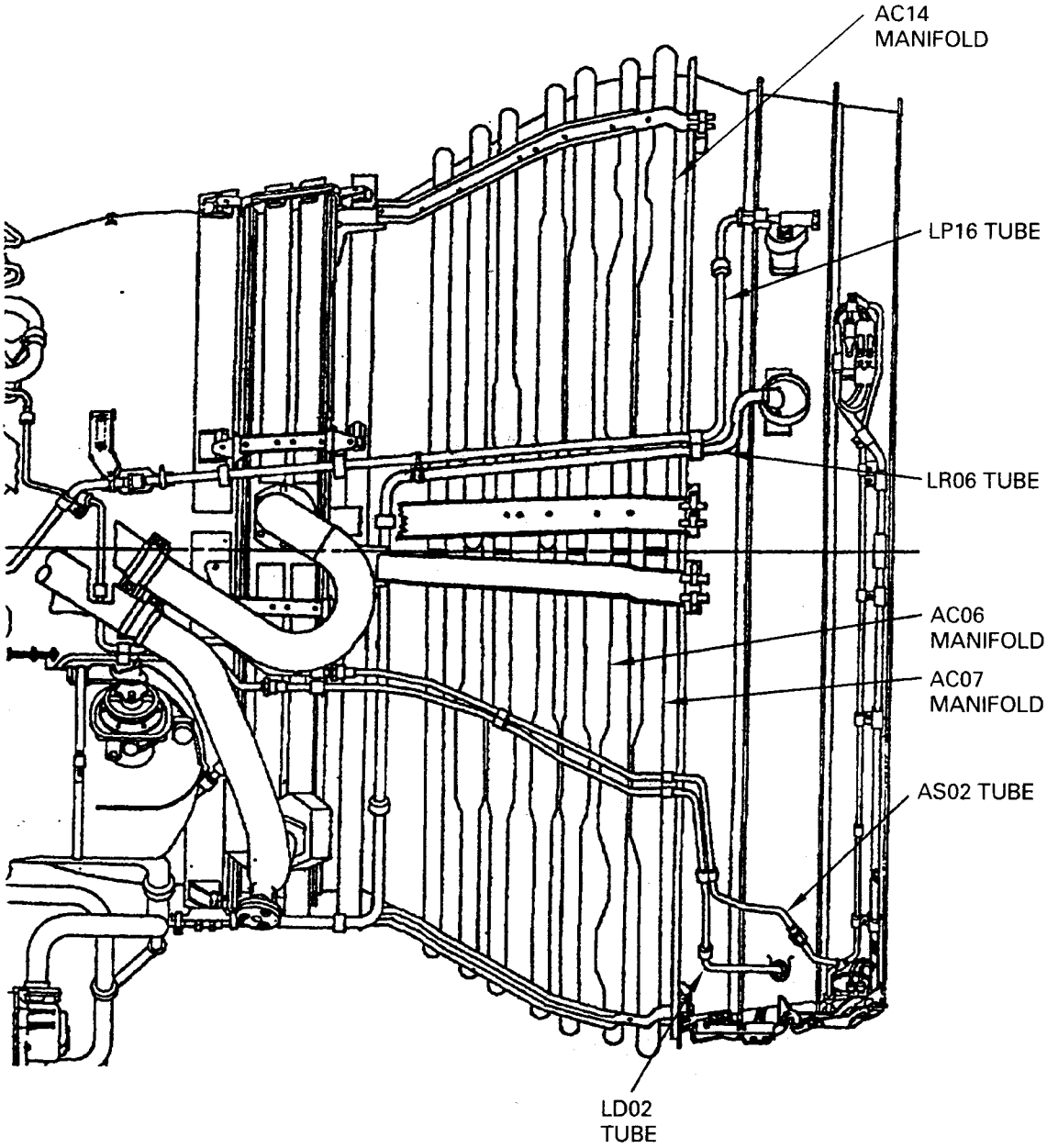
CAUTION : DO NOT APPLY LUBRICANTS TO THE EEC PT4.95 TUBE NUT. CONTAMINA-

TION OF THE EEC AND DAMAGE CAN RESULT.

(a)Remove the protective cover. Install the rear EEC PT4.95 tube to the EEC PT4.95 manifold (AS03). Tighten the tube nut by hand.

(b)Tighten any previously loosened clamps.

(c)TORQUE the tube nut to between 270 and 300 lbf.in. (3.06 and 3.38 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the tube nut.



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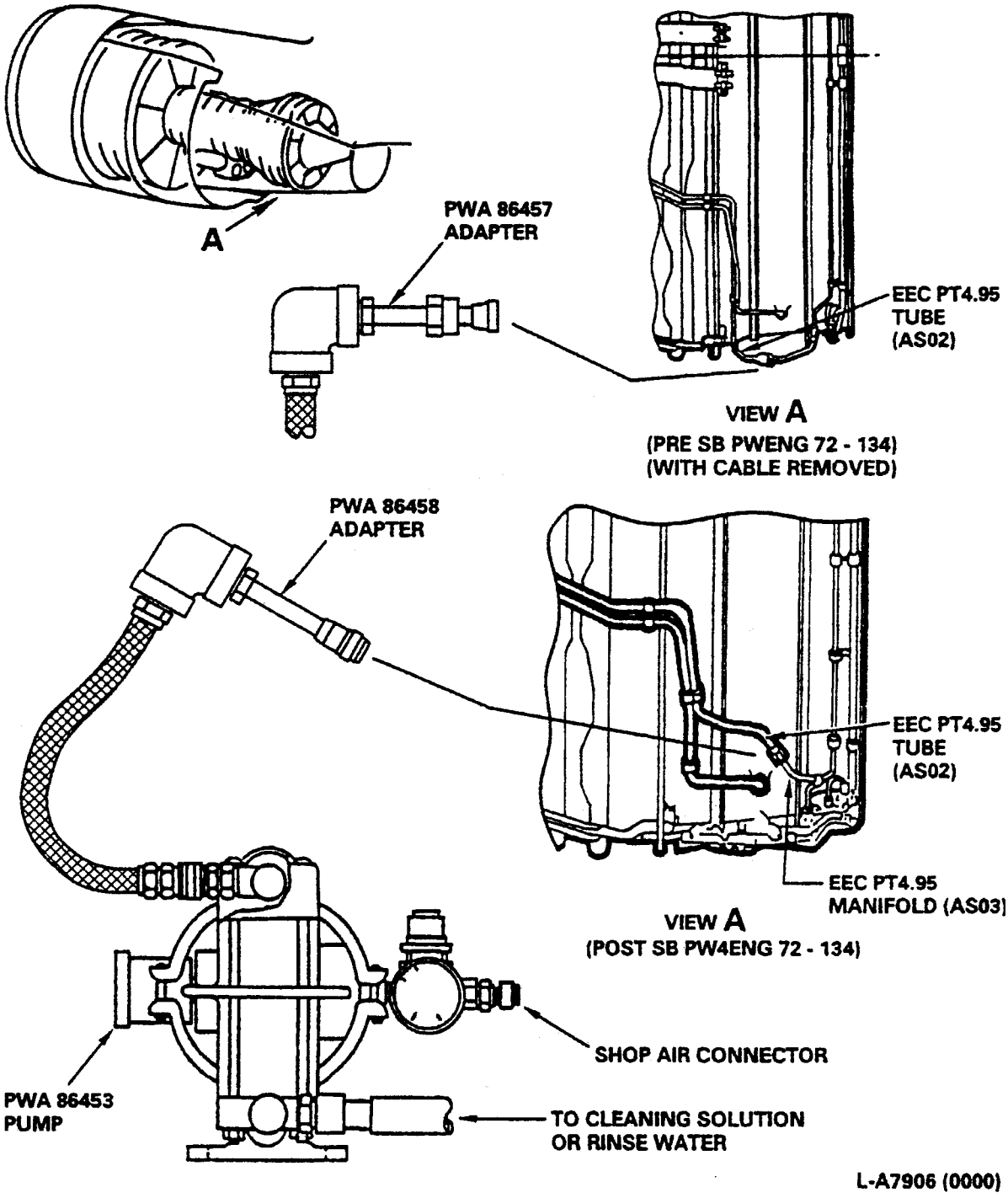
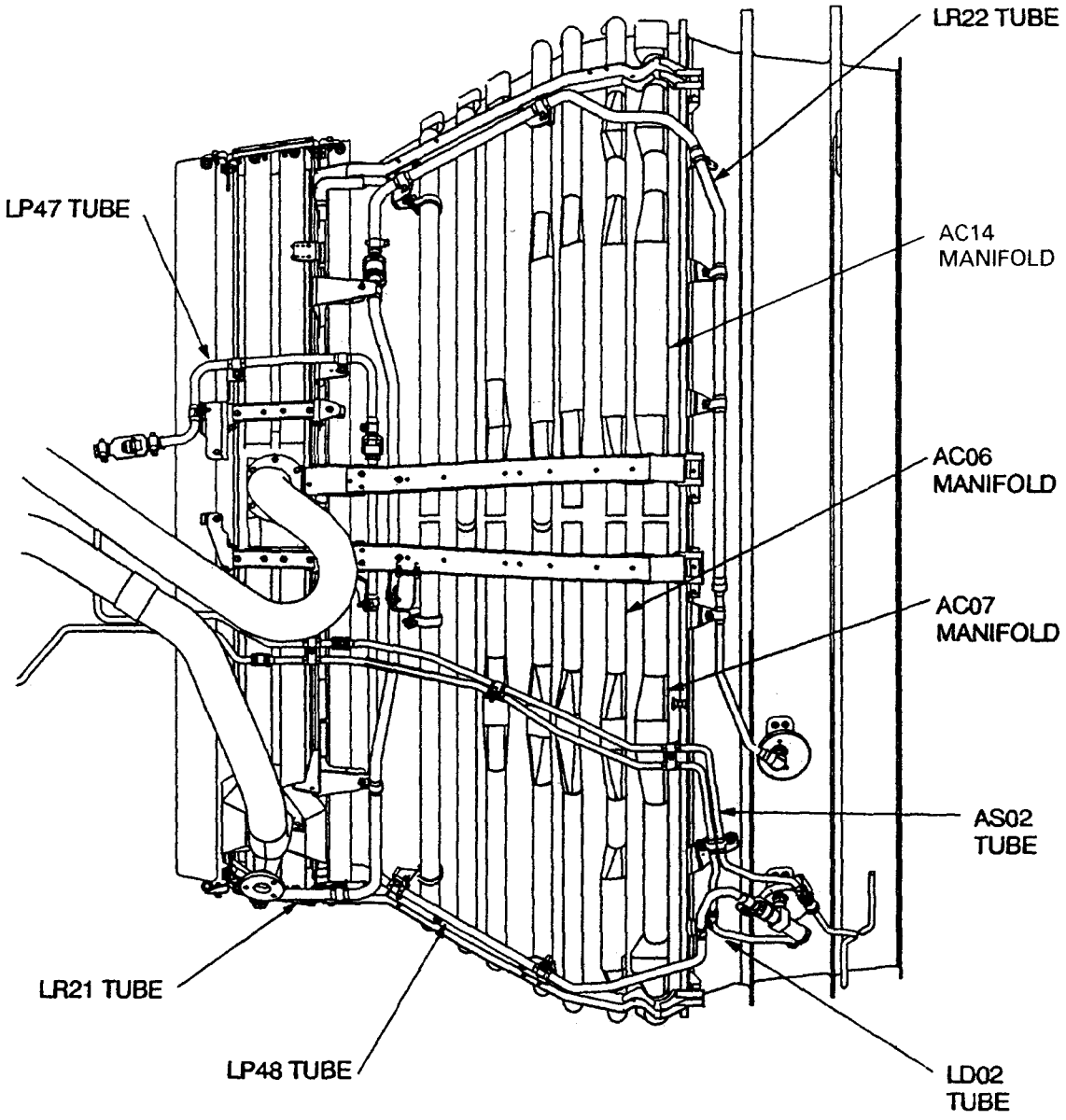
Pressure Sensing Holes Cleaning
(Pre SB PW4ENG 79-76)(Sheet 1/2)
Figure 707



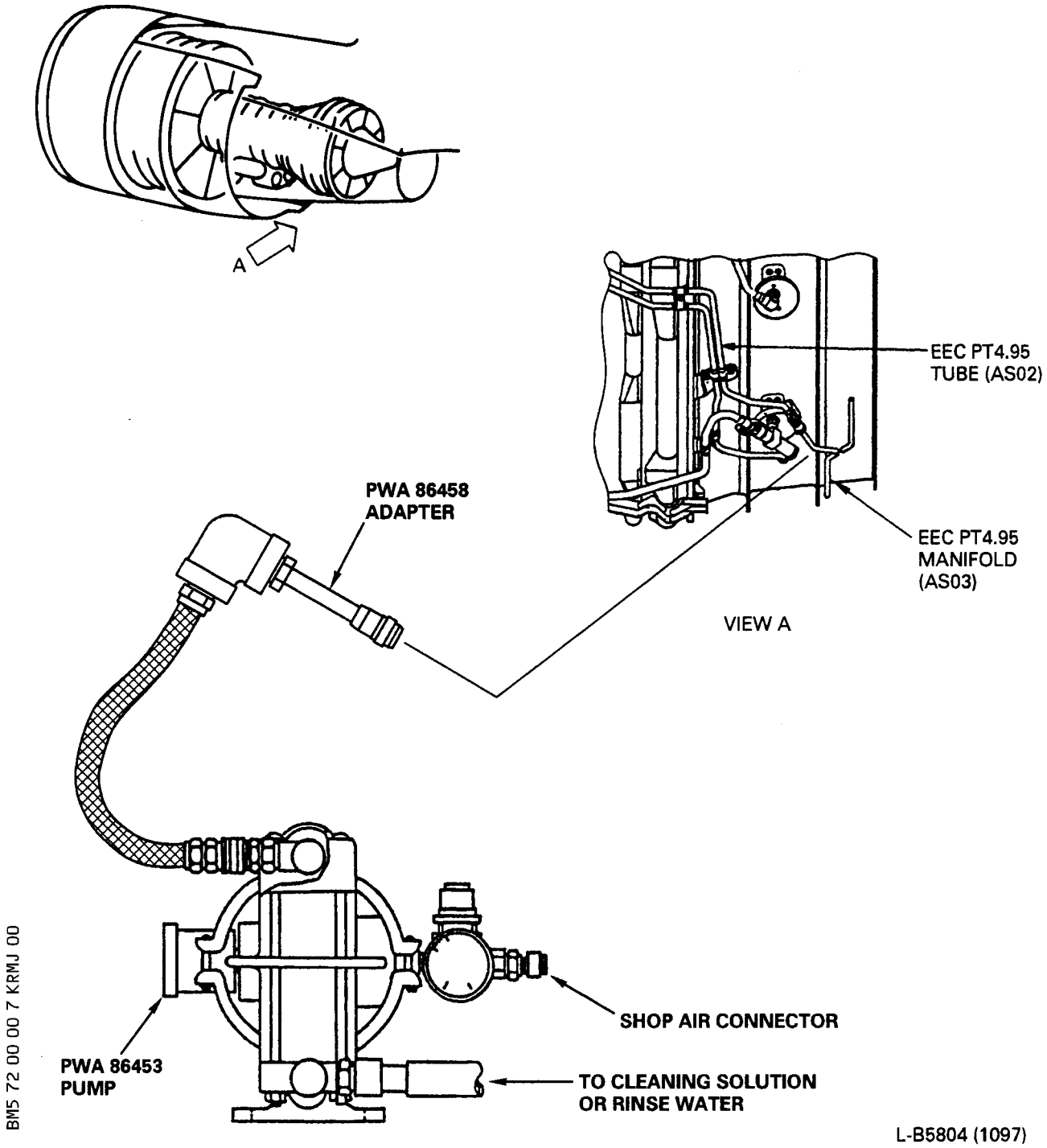
BM5 72 00 00 7 KQMB 00

Pressure Sensing Holes Cleaning
(Pre SB PW4ENG 79-76)(Sheet 2/2)
Figure 707



BM5 72 00 00 7 KRMA 00

Pressure Sensing Holes Cleaning
(Post SB PW4ENG 79-76)(Sheet 1/2)
Figure 708



BM5 72 00 00 7 KRMJ 00

Pressure Sensing Holes Cleaning
(Post SB PW4ENG 79-76)(Sheet 2/2)
Figure 708

4. Clean Engine Exterior

A. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedure - 70-00-00, P. Block 201	Engine - Standard Practices

B. Procedure

(1)Remove grease, oil and/or dirt from engine exterior as necessary (Ref. 70-00-00, P. Block 201, SPOP 1).

(2)Clean electrical wiring harnesses and contact points as necessary (Ref. 70-00-00, P. Block 201, SPOP 6).

5. Engine Cleaning after Chemical Contact with Fire Extinguishing Agents, Hydraulic Fluid, Oil or Fuel

A. General

(1) SPOP 425 provides information to determine appropriate actions for engines that have come in contact with fire extinguishing agents, hydraulic fluid, oils or fuel (Ref. 70-00-00, P. Block 201, SPOP 425).

R 6. Clean the Full Engine Gaspath (Water Wash) for Performance
R Improvement - EcoPower (R) (Alternate to Water Wash)

R A. Clean the full engine gaspath for performance improvement with EcoPower (R) method.
R CAUTION : EXCEPT FOR WORK OR SUPPLIES TO BE PERFORMED OR FURNISHED BY PRATT & WHITNEY, PRATT & WHITNEY DOES NOT ENDORSE THE WORK PERFORMED BY THE COMPANY OR COMPANIES IDENTIFIED HEREIN OR ANY OTHER COMPANY AND DOES NOT ACCEPT RESPONSIBILITY TO ANY DEGREE FOR THE SELECTION OF SUCH COMPANY OR COMPANIES FOR THE PERFORMANCE OF ANY WORK OR PROCUREMENT OF SUPPLIES.
R (1)This is a proprietary procedure. The source licensed for this procedure is Pratt & Whitney Line Maintenance Services (EcoPower(R)). To locate a franchised source in your local area, contact the Pratt & Whitney 24 Hour Customer Help Desk at (860) 565-0140. Ask about the Ecopower(R) engine wash system.
R (2)Sources must be licensed to perform this proprietary procedure. Write to the address listed below for information to become a licensed source.
R Pratt & Whitney, A United Technologies Company
R Manager, Joint Ventures, Partnerships and Licensing
R 400 Main St., Mail Stop 133-58
R East Hartford, CT 06108 USA
R E-mail: gppwlicng[at]pw.utc.com
R E-Fax: 860-557-7197

AIR INLET SECTION - DESCRIPTION AND OPERATION

1. Definition (Ref. Fig. 001)

The induction system provides airflow to the engine of sufficient quality (inlet recovery and distortion) to ensure the engine will meet ground and flight operational performance and stability requirements.

To ensure stable engine operation, preclude adverse effects on engine durability and limit performance losses to those attributable to an equivalent uniform pressure loss, inlet distortion is maintained within limits. These limits are expressed in terms of the pressure and temperature measured at the engine inlet section as follows :

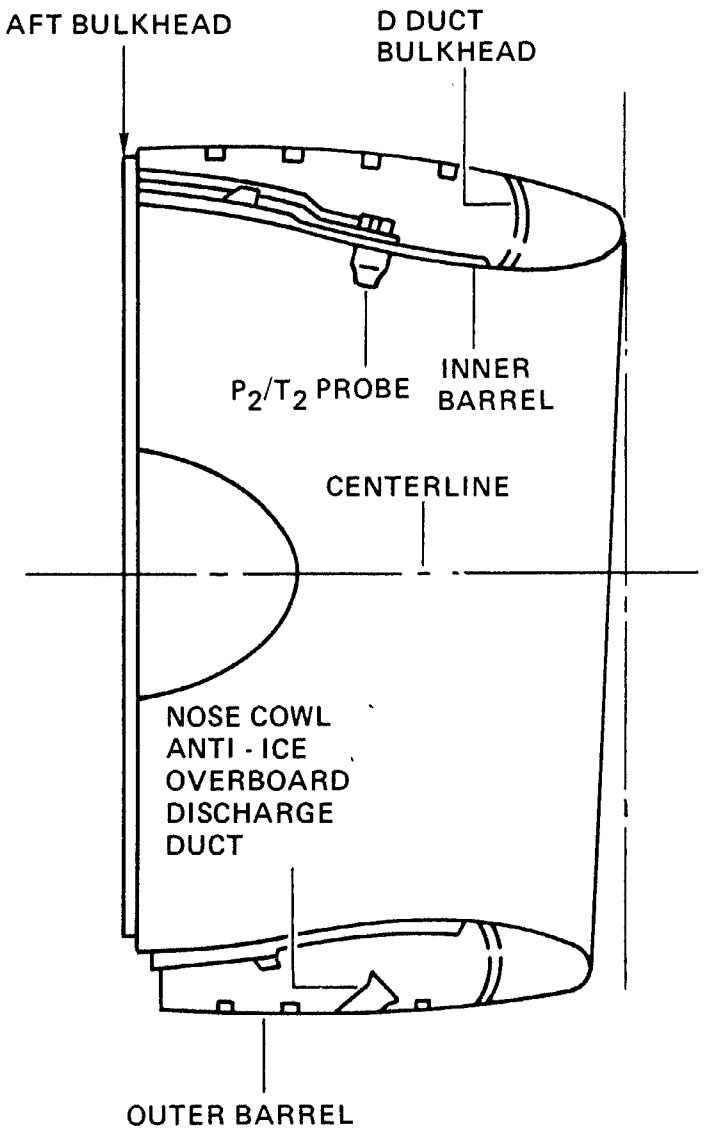
- radial total pressure distortion limits
- circumferential total pressure distortion limits.

These two first total pressure distortion limits are function of corrected airflow.

- temperature distortion limits
- combined total pressure and temperature distortion limits.

Combined pressure and temperature distortion can produce instability at distortion levels under the limits of individual procedure and temperature parameter.

These distortion limits are modified when fan area changes during thrust reversing.



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DM5

Nose Cowl Installation
Figure 001

FAN ROTOR ASSEMBLY - DESCRIPTION AND OPERATION

1. Description

The fan group is driven by the front compressor drive turbine and flows the air through the fan nozzle (secondary flow) and through the fromt compressor (primary flow) toward the core of the engine.
The fan rotor assembly consists of the 1st stage axial compressor rotor assembly and front compressor rotor assembly.

2. 1st Stage Axial Compressor

The 1st stage axial compressor rotor consists of the fan hub assembly, the fan blade assembly and the inlet cone.

A. Hub Assembly

The hub is constructed of titanium. It is splined to the turbine shaft coupling which in turn is splined to the LPT shaft. Structural support for the rotor is provided by the No. 1 ball bearing which is mounted on the front compressor hub.

B. Fan Blade Assembly (Ref. Fig. 001)

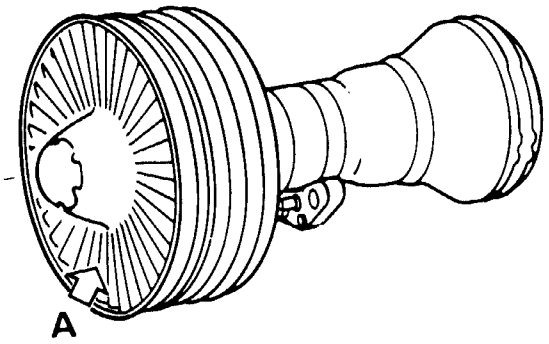
The 38 wide chord blades fabricated of titanium, which are installed in slots 12 degrees from axial in the front compressor hub. The fan blades are retained at the rear by the drum rotor and at the front by a circumferential blade lock installed in aligned slots in the hub. Each fan blade has a single aft positioned part span shroud for added strength. Fan blades are replaceable in balanced pairs on installed engines.

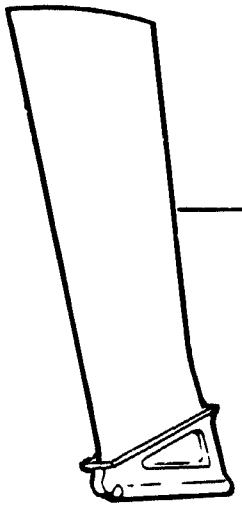
C. Compressor Inlet Cone (Ref. Fig. 002)

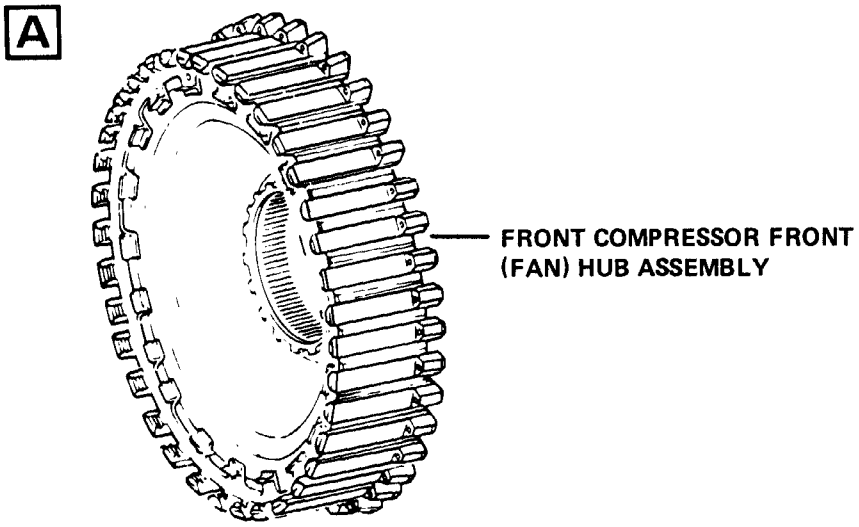
The compressor inlet cone segment assembly is mounted on the front compressor hub and provides a smooth aerodynamic fairing at the inlet of the LPC. The compressor inlet cone segment assembly consists of an inlet cone front segment which is bolted to an inlet cone (rear) segment assembly which is bolted in turn to the front flange of the front compressor hub. Both inlet cone segments are fabricated from Kevlar fabric impregnated with epoxy resin.

3. Front Compressor Rotor Assembly

(Ref. Fig. 003, 004)
The front compressor rotor consists of the 1.6 through fourth stage disk and blade assembly.
The front compressor disks, and blades are fabricated of titanium.
The front compressor rotor is mounted on the front compressor hub which is driven by the low pressure turbine (LPT).
The 1.6 2nd 3rd and 4th stage blades are held in their disks by dovetail-root sections which fit into broached slots in disk rim. Blade locks and lock retainers hold blades in place.







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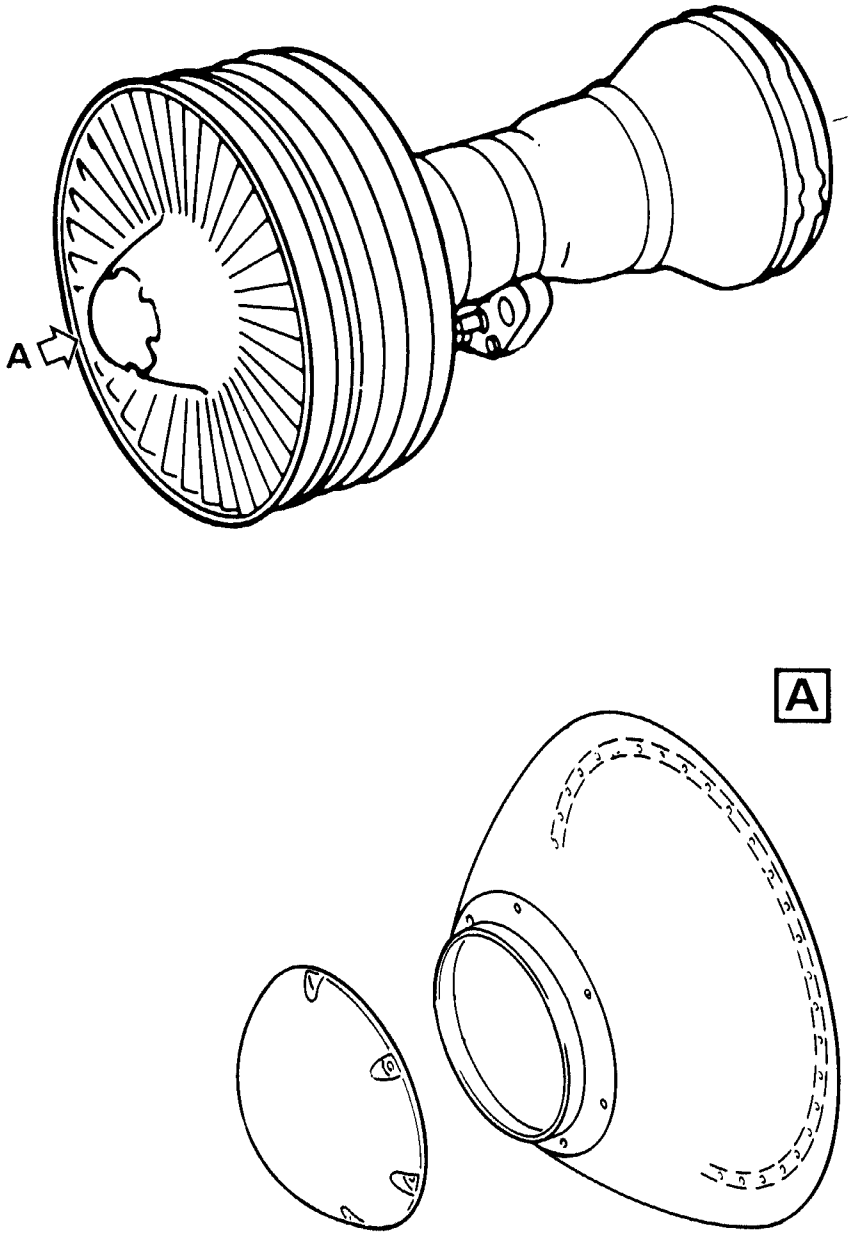
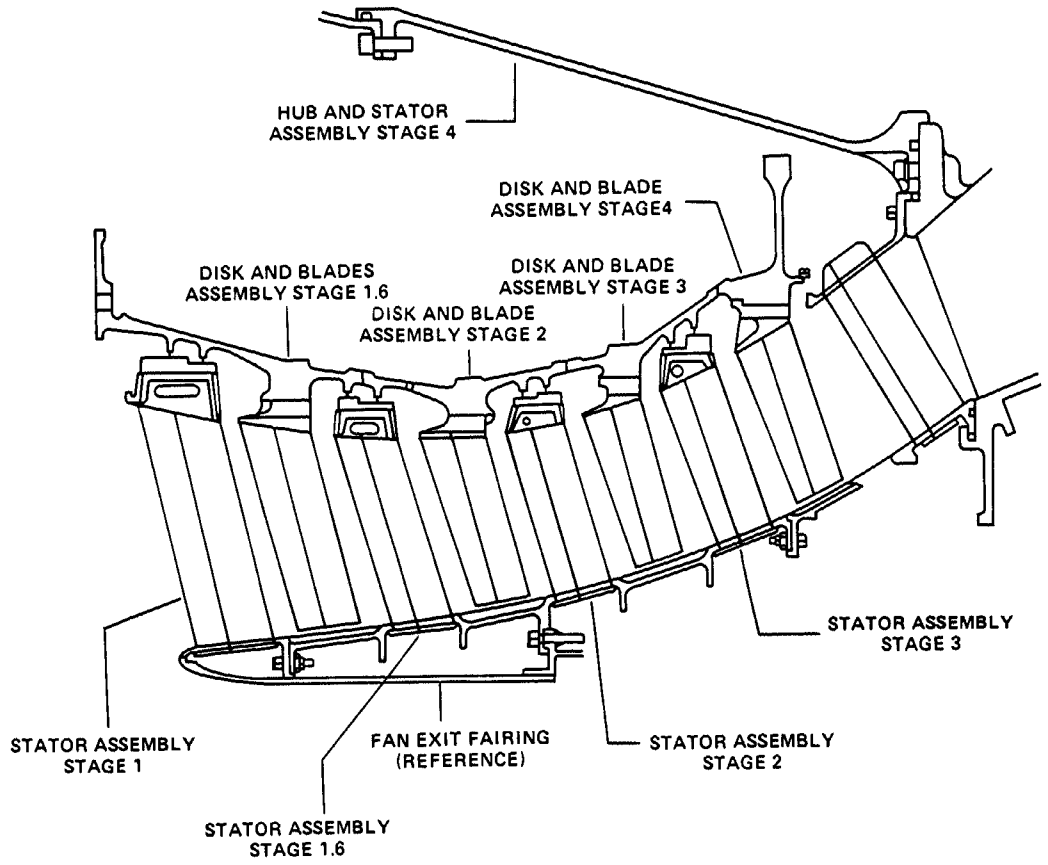
Fan Blade Assembly
Figure 001



Compressor Inlet Cone
Figure 002


HUB AND STATOR ASSEMBLY STAGE 4
DISK AND BLADE ASSEMBLY STAGE4
DISK AND BLADES ASSEMBLY STAGE 1.6
DISK AND BLADE ASSEMBLY STAGE 3
DISK AND BLADE ASSEMBLY STAGE 2
STATOR ASSEMBLY STAGE 3
STATOR ASSEMBLY STAGE 1
FAN EXIT FAIRING (REFERENCE)
STATOR ASSEMBLY STAGE 2
STATOR ASSEMBLY STAGE 1.6

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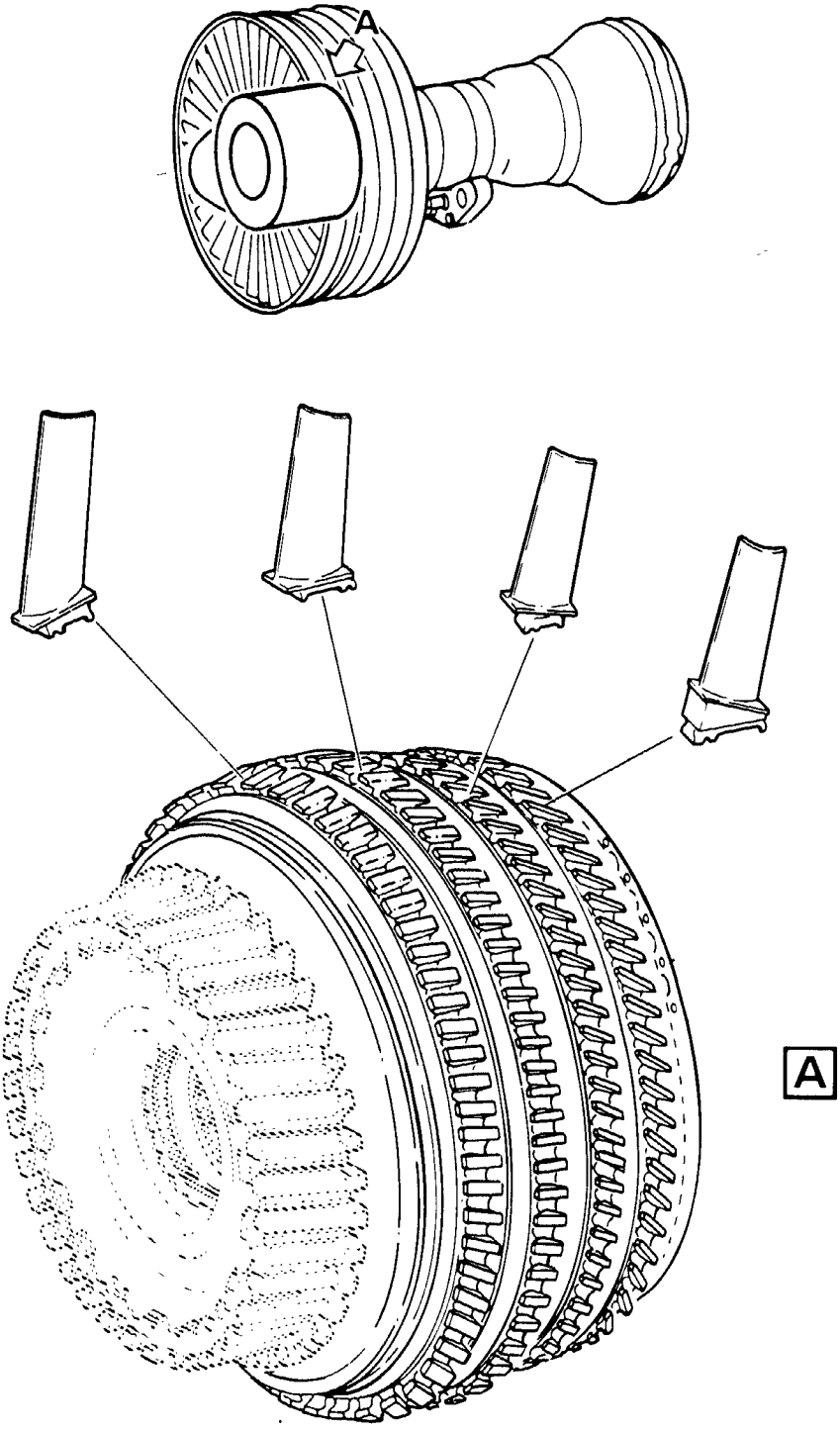
Front Compressor - Cross Section
Figure 003



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Front Compressor
Figure 004

INLET CONE - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A. Material No.P03-001	Oils (Ref. 70-00-00)
B. Material No.P05-045	Special Materials (Ref. 70-00-00)
C.	Torque Wrench 85-95 lbf.in. (0.96 - 1.07 m.daN)
D. PWA86122	Puller, Knocker
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

2. Procedure

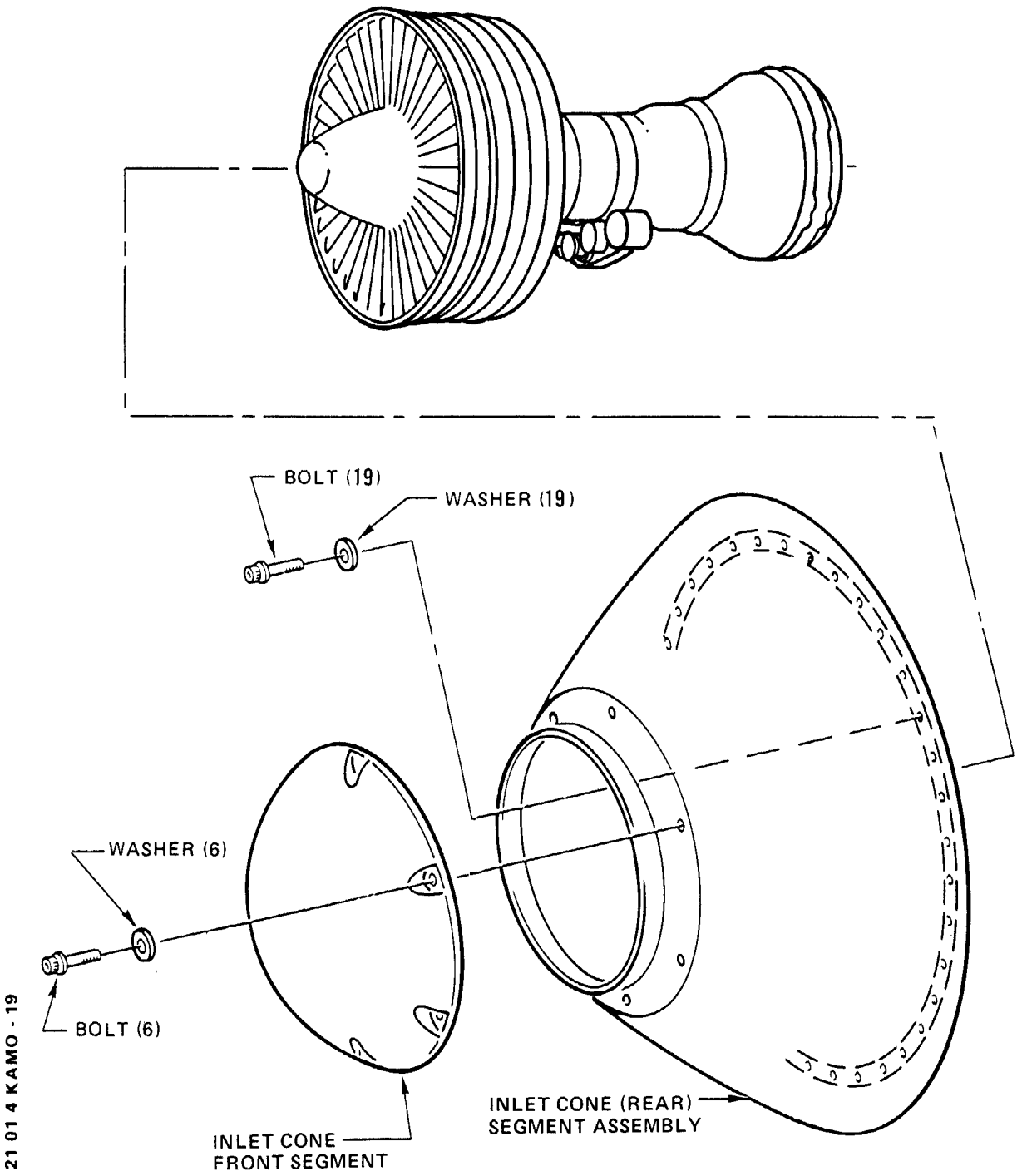
A. Job Set-Up
(1)Open, safety and tag circuit breakers for the appropriate engine (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401)
(1)Using Marking Pen, Material No.P05-045 or equivalent, mark the inlet cone front segment, the inlet cone (rear) segment, and the front compressor hub to ensure alignment during reinstallation.
(2)Remove six bolts and washers securing inlet cone front segment to inlet cone (rear) segment and remove front segment.
WARNING : DO NOT ALLOW INLET CONE TO FALL FROM ENGINE OR INJURY TO OPERATOR OR CONE MAY RESULT.
(3)Remove 19 bolts and washers securing inlet cone (rear) segment to front
CAUTION : DAMAGE TO NUT PLATES AND/OR INLET CONE CAN OCCUR IF PWA86122 PULLER IS NOT INSTALLED BETWEEN INLET CONE NUT PLATES.
(4)Install PWA86122 Puller to the inner side of inlet cone. (Ref. Fig. 402)
(5)Remove inlet cone (rear) segment and place on pallet or workbench.

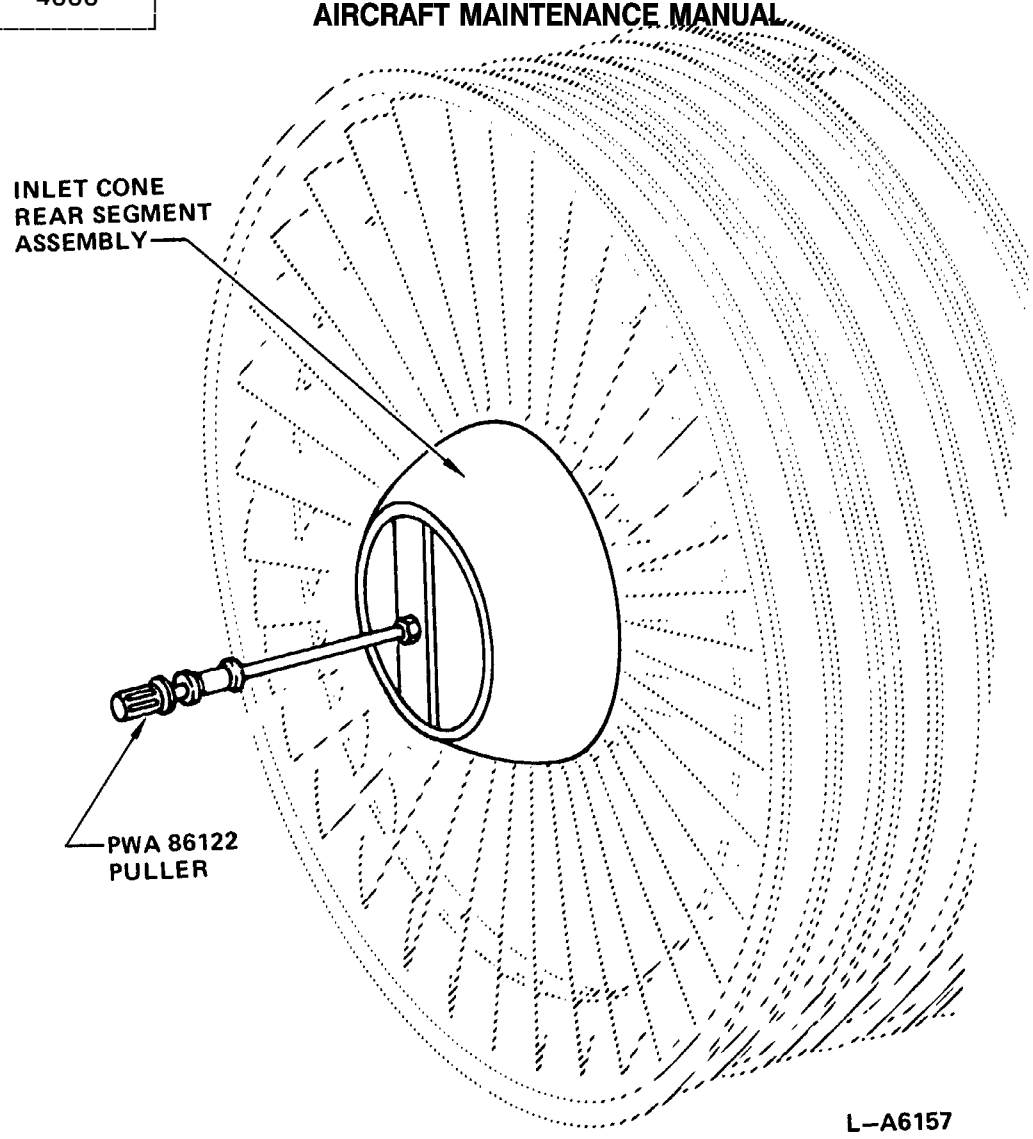
C. Installation (Ref. Fig. 401)
WARNING : DO NOT ALLOW INLET CONE TO FALL FROM ENGINE OR INJURY TO OPERATOR OR CONE MAY RESULT.
R (1)For engines Pre SB PW4ENG 72-792, install the inlet cone (rear) segment
R to the front compressor hub.
R (a)Apply engine oil (Material No. P03-001) to the threads of 19 bolts
R you will use to install the inlet cone (rear) segment.
R (b)In the following step, align the marking pen mark on the inlet cone
R (rear) segment with the pen mark on the front compressor hub.
R NOTE : It is not necessary to line up marks during installation of
R a new inlet cone or one that has been repaired and balanced.
R New and repaired inlet cones are balanced to within 1.0 oz-in.
R (720.0 g.mm) and do not need to be aligned at installation.
R (c)Install the cone segment to hub with 19 washers and lubricated bolts.
R Use a non-metalic blunt object (plastic scraper or equivalent) and
R make sure the seal is installed under the fan blade platform leading

R edge before you tighten the bolts.
R (d)Tighten and TORQUE the bolts to between 85 and 95 lbf.in. (0.96 and
R 1.07 m.daN).
R (2)For engines Post SB PW4ENG 72-792, install the inlet cone (rear) segment
R to the front compressor hub.
R (a)Apply engine oil (Material No. P03-001) to the threads of 19 bolts
R you will use to install the inlet cone (rear) segment.
R (b)In the following step, align the marking pen mark on the inlet cone
R (rear) segment with the pen mark on the front compressor hub.
R NOTE : It is not necessary to line up marks during installation of
R a new inlet cone or one that has been repaired and balanced.
R New and repaired inlet cones are balanced to within 1.0 oz-in.
R (720.0 g.mm) and do not need to be aligned at installation.
R (c)Put the inlet cone (rear) segment on the front compressor hub and
R loosly install four washers and lubricated bolts. Install the bolts
R as equally spaced as possible.
R WARNING : DO NOT USE YOUR FINGERS TO PUSH THE SEAL BULBS. YOU CAN
R PINCH YOUR FINGERS.
R (d)Push the inlet cone front opening and tighten the four bolts finger
R tight.
R CAUTION : SOME OF THE FAN BLADE PLATFORM SEALS CAN BE LOOSE AND CAN
R TOUCH THE CONE SEAL. MAKE SURE THAT THERE IS NO INTERFERENCE
R BETWEEN THE BLADE PLATFORM SEALS AND THE CONE SEAL. THE CONE
R SEAL MUST BE PUT RADIALLY INBOARD IN RELATION TO THE FAN
R BLADE PLATFORM SEALS FOR THE CORRECT INSTALLATION OF THE
R CONE.
R (e)Use a locally fabricated plastic or wooden thin blade tool with a
R flat surface that measures approximately 1.250 in. (31.750 mm) wide
R to push the bulb portion of the seal at each location to put all of
R the seal bulbs radially inboard in relation to the fan blade platform
R seals.
R (f)Tighten the four bolts finger tight again.
R (g)Install the remaining bolts and washers.
R (h)Tighten and TORQUE the bolts to between 85 and 95 lbf.in. (0.96 and
R 1.07 m.daN).
R (3)Install the inlet cone front segment.
R (a)Apply engine oil (Material No. P03-001) to the threads of the six
R bolts you will use to install the inlet cone front segment.
R (b)If there are alignment marks, align the pen mark on the inlet cone
R front segment with the pen mark on the inlet cone (rear) segment.
R (c)Install the cone front segment with six washers and lubricated
R bolts.
R (d)Tighten and TORQUE the bolts to between 45 and 50 lbf.in. (0.51 and
R 0.56 m.daN).

D. Close-Up
(1)Remove safety clips and tags and close circuit breakers (Ref. 71-13-00,
P. Block 301).



Inlet Cone
Figure 401



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Inlet Cone Removal
Figure 402

INLET CONE - INSPECTION/CHECK

1. Equipment and Materials

ITEM	DESIGNATION
A. Material No.P05-055	Special Materials (Ref. 70-00-00)
Referenced Procedures	
- 72-21-01, P. Block 401	Inlet Cone
- 72-21-01, P. Block 801	Inlet Cone

2. Procedure

A. Inspection (Ref. Fig. 601)

NOTE : Length to depth (L/D) ratio equals five unless otherwise noted. Limits apply to damaged area after blending and not to magnitude of damage measured before blending.

(1) Inspect inlet cone for cracks or delamination caused by bird strike, ice ingestion or other object damage.

(a) Inspect exterior surface of inlet cone for visible cracking or delamination caused by foreign object damage (FOD).

(b) Inspect interior surface of inlet cone for visible cracking or delamination. Impact damage to outer surface of cone segment which causes visible cracking or delamination of inner surface indicates major structural damage and cone segment must be removed from service (Ref. 72-21-01, P. Block 401).

NOTE : Inlet cones which have been subjected to bird strike, ice ingestion, ot the use of impact tools in removal of installation are particularly susceptible to this type of damage.

B. Continue-In-Service Limits

(1) External cone surface FOD (visual) limits are as follows :

(a) Minor paint chips, dents or scratches which do not cause crazing with a primary path to inside surface of cone are acceptable without restriction.

(b) Crack indications on any surface location which are through the composite material after internal inspection are not permitted and the part must be removed.

(c) Cracks are permitted in the black protective paint but must not progress into the composite material and must be within the limits that follow :

1 The maximum crack length is 12.0 in. (304.8 mm) for each crack.
2 A maximum of 10 cracks are permitted for each inlet cone.
3 The cracks must be in the resin rich areas and must not go into the composite material. Find the correct crack depth by lightly sanding the surface with Emery Paper (Material No.P05-055).
4 The cracks must not cause delamination.
5 The end of the crack must be at least 2.0 in. (50.8 mm) away from the trailing edge.

(2) External cone surface damage limits are as follows :

(a) No delamination or peeling permitted on composite material surface.

R (b)For PN 794629 cone (front) segment, erosion or peeling of the black protective paint is permitted up to 50% of the surface area, but the part must be replaced at the earliest convenience or at the next scheduled maintenace/overhaul action (Ref. 72-21-01, P. Block 801). If the area of erosion or peeling is more than 50% of the surface area, the cone (front) segment must be replaced within 50 hours maximum.

(c)For PN 51A681 and 51A760 cone (front) segment, erosion, peeling or flaking of the fluoroelastometer coating is not permitted except in the bolt pocket corners. Missing coating in the bolt pocket corners can be repaired (Ref. 72-21-01, P. Block 801). If the coating is missing in any other area, the segment must be replaced within 50 hours maximum.

NOTE : This repair is temporary and the part must be replaced at the next scheduled maintenance.

(d)For cone (rear) segment, erosion or peeling of the black protective paint is permitted up to 10% of the surface area, but the part must be replaced at the earliest convenience or at the next scheduled maintenance/overhaul action (Ref. 72-21-01, P. Block 801). If the area of erosion or peeling is more than 10% of the surface area, the cone (rear) segment must be replaced within 50 hours maximum.

(3)Internal flange area visible crack limits are as follows :

(a)Minor paint chips, dents, scratches or discontinuous crazing at resin rich areas in front flange or minor discontinuous crazing in resin rich areas at rear flange are acceptable without restriction.

NOTE : The front and rear flange cannot be readily seen. Therefore, if inlet cone is suspected of having damage, front segment must be removed and inside of inlet cone inspected (Ref. 72-21-01, P. Block 401).

(4)Inlet cone rear segment seal damage limits are as follows :

(a)Remove any portion of the seal that is loose, hanging into, or protruding into the gaspath by trimming as close to the inlet cone external surface as possible.

(b)Any amount of seal is permitted to be missing, but the seal must be replaced at the next scheduled maintenance opportunity or at the next C Check.

C. Flyback Limits

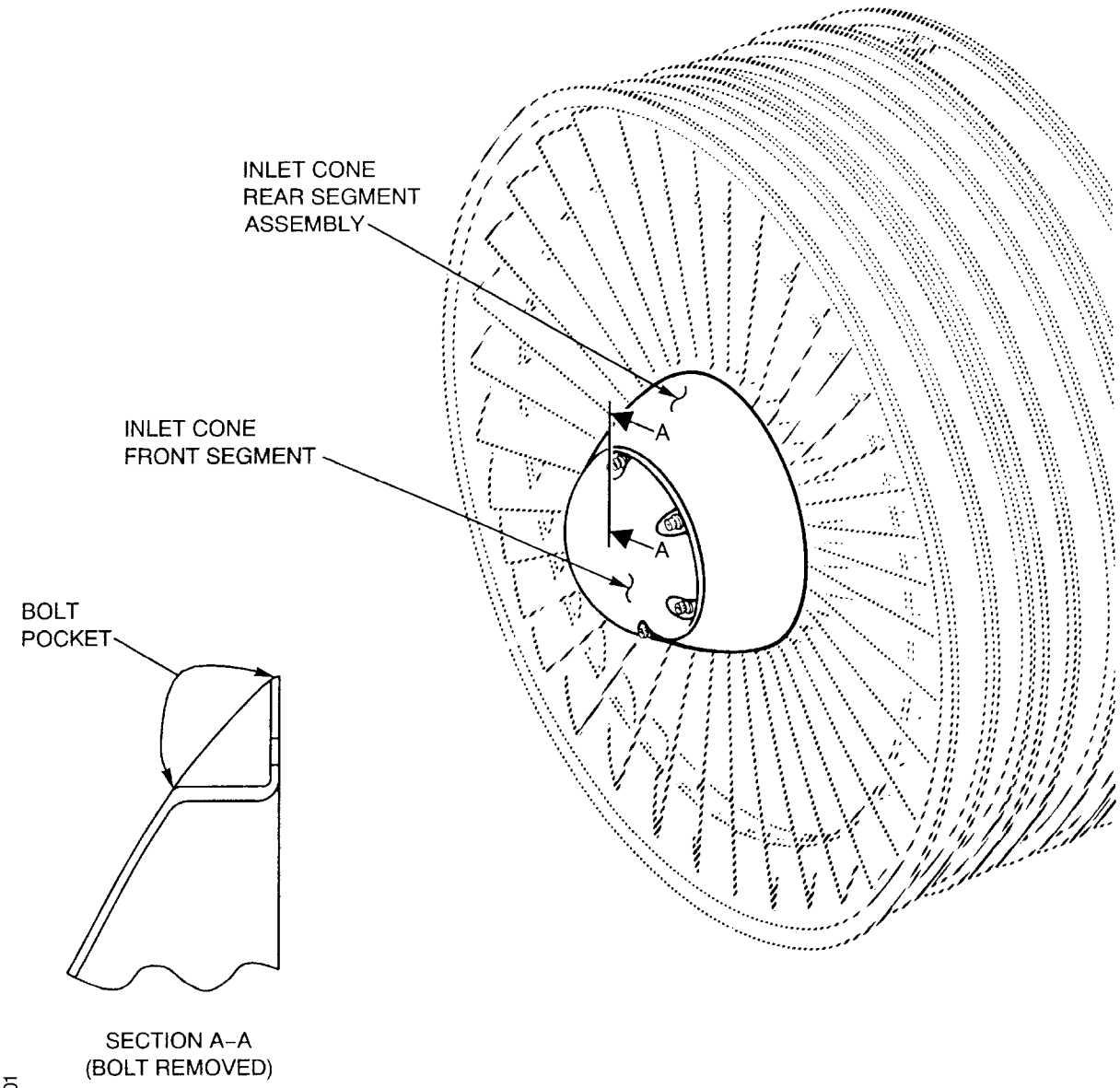
(1)Flyback limits are for maximum of 50 hours.

(a)Composite material delamination or peeling, chips or dents not exceeding 0.06 in. (1.524 mm) in depth or 1.500 in. (38.100 mm) in diameter, or local cracks which upon inspection of inside of inlet cone are not longer than 0.500 in. (12.700 mm) are permitted for flyback limit only.

(b)Any damage exceeding above flyback limits requires removal of part, assembly or engine. (Ref. 72-21-01, P. Block 401).

NOTE : Inlet cone front segment can be used if through cracks are evident providing it is reasonably secured to rear segment.

(c)Any crack that ends less than 2.0 in. (50.8 mm) away from the trailing edge is permitted for the flyback limit only.



Inlet Cone Inspection/Check
Figure 601

INLET CONE - APPROVED REPAIRS

1. Inlet Cone Seal Replacement Procedure (Ref. Fig. 801, 802)

A. Equipment and Materials

ITEM	DESIGNATION
A. Material No.P05-005	Special Materials (Ref. 70-00-00)
B. Material No.P05-131	Special Materials (Ref. 70-00-00)
C. Material No.P09-014	Sealants (Ref. 70-00-00)
D. Material No.P11-014	Cleaning Agents (Ref. 70-00-00)

B. Remove inlet cone seal by scraping down to parent material.

C. Wipe surface clean with Material No.P05-005 dampened with Material No.P11-014 Air Dry.

D. Fit new cone seal around and into step on inlet cone support and trim to length as shown in figure (Ref. Fig. 801).

E. Clean trimmed ends of cone seal thoroughly by wiping with Material No.P05-005 dampened with Material No.P11-014 and air dry.

F. Apply Material No.P09-014 approximately 0.010 in. (0.254 mm) thick to trimmed ends of new cone seal. Bond ends together to form uniform ring. Allow sealant to cure for minimum of 24 hours at room temperature.

NOTE : To ensure thoroughly bonded joints, sealant applications should be accomplished in area free from oil, fumes, spray, dust, etc. Materials, tooling, fixtures and handling equipment shall be free of contaminants.
Curing of sealant must be achieved under conditions of minimum of 50 degrees relative humidity and temperature of 70° - 95°F (21° - 35°C).

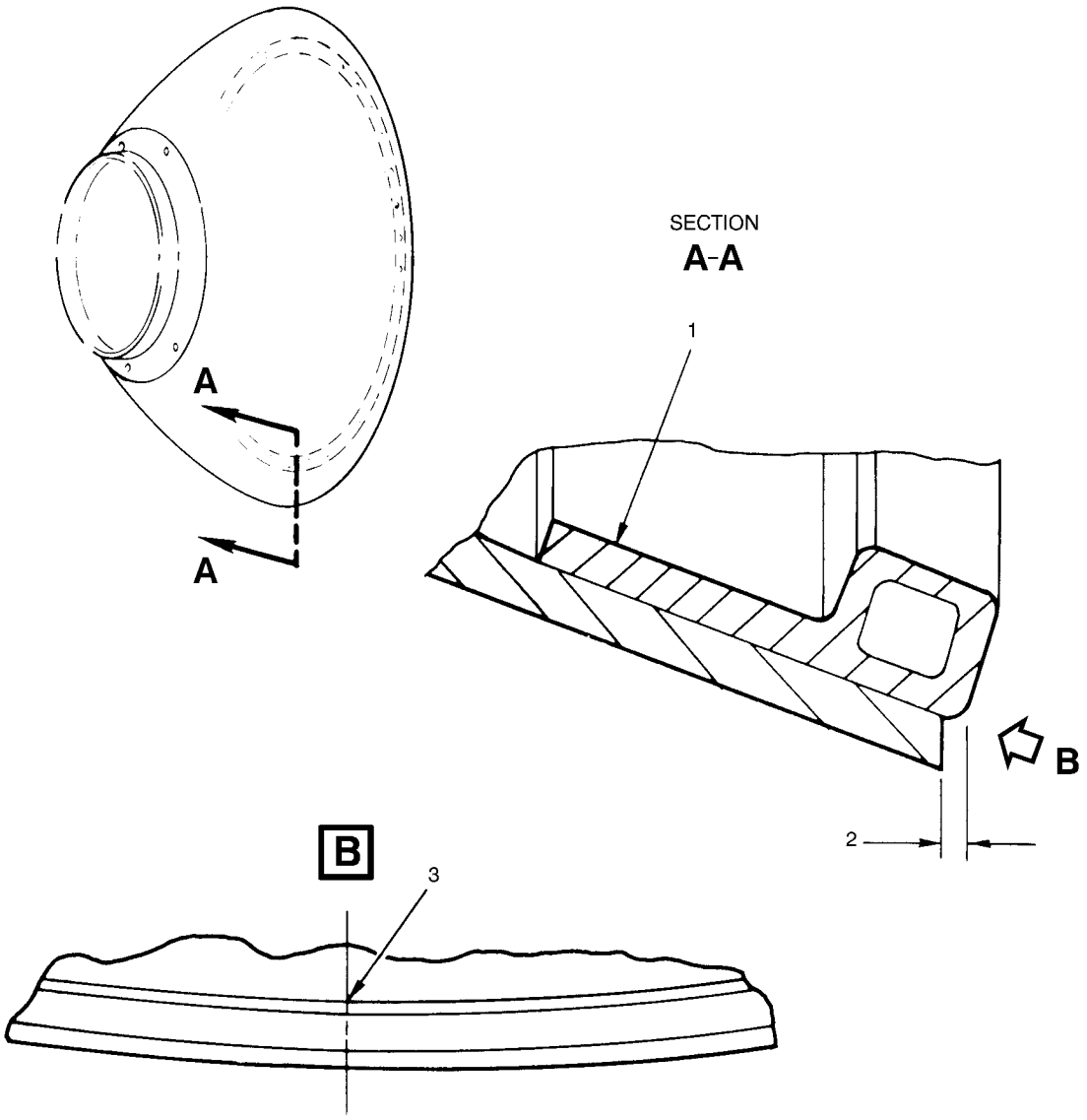
G. Using Material No.P05-131, roughen the bonding joints of cone seal to uniform matt finish.

H. Wipe clean with Material No.P05-005 dampened with Material No.P11-014 Air dry.

I. Apply Material No.P09-014 to the bonding joints cone seal and cone support, and bond them together. Allow sealant to cure for minimum of 24 hours at room temperature.

2. Repair the Inlet Cone Protective Layer (Ref. Fig. 803, 804)

A. Equipment and Materials

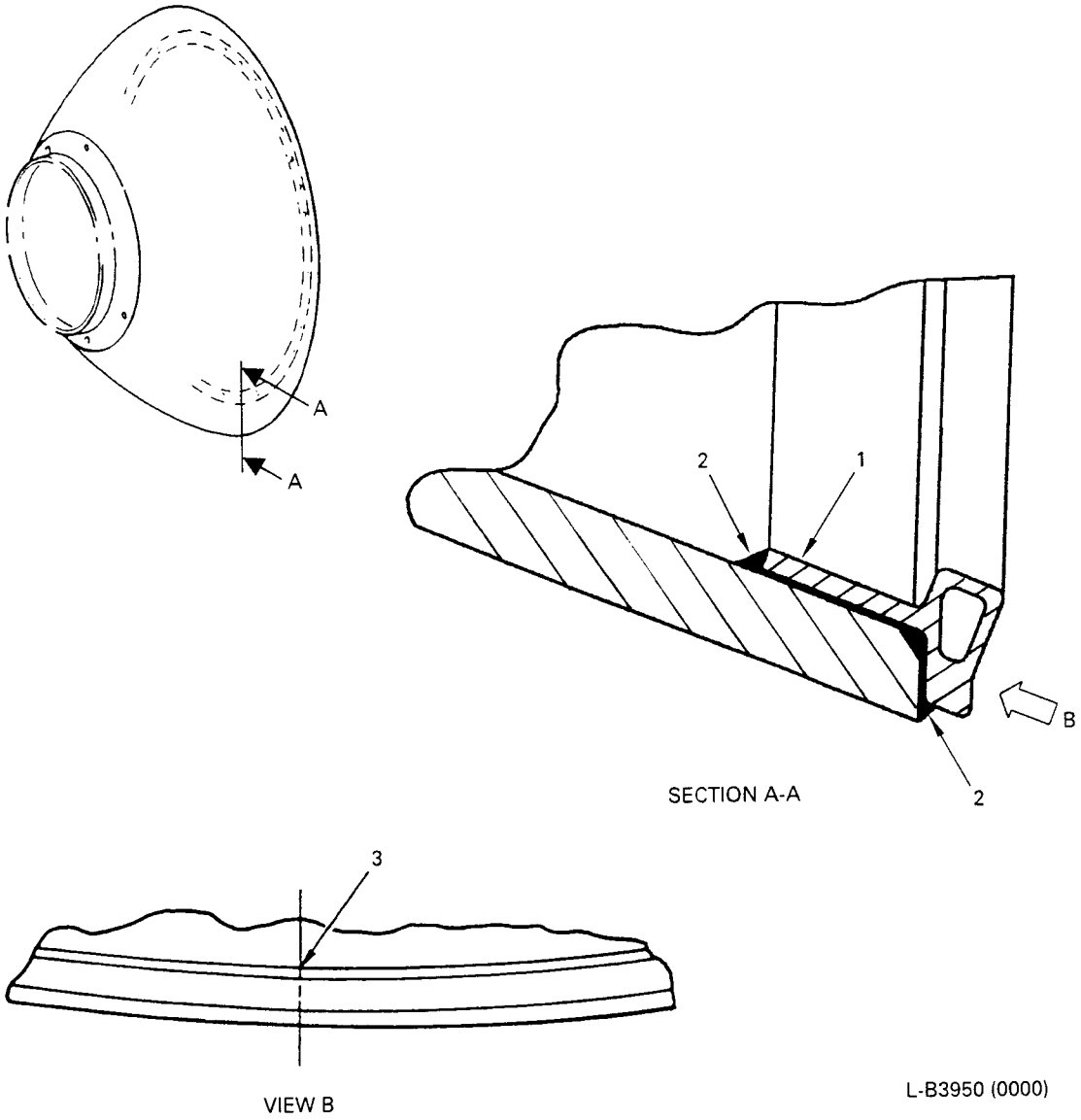


BM5 72 21 01 8 KAM0 01

1 - COMPRESSOR INLET CONE SEAL
2 - 0.000 - 0.030in. (0.000 - 0.762mm) TO SHARP CORNER
3 - BONDED JOINT

L-A2258

Compressor Inlet Cone
(Pre SB PW4ENG 72-594) Seal Replacement
Figure 801



1. COMPRESSOR INLET CONE SEAL
2. FORM FILLET USING ADHESIVE - 2 PLACES
3. BONDED JOINT

BM5 72 21 01 8 KFM0 00

Compressor Inlet Cone
(Post SB PW4ENG 72-594) Seal Replacement
Figure 802

ITEM	DESIGNATION
A. Material No.P05-005	Special Materials (Ref. 70-00-00)
B. Material No.P05-053	Special Materials (Ref. 70-00-00)
C. Material No.P05-054	Special Materials (Ref. 70-00-00)
D. Material No.P05-055	Special Materials (Ref. 70-00-00)
E. Material No.P11-014	Cleaning Agents (Ref. 70-00-00)

B. Remove polyurethane coating down to fiberglass, using Material No.P05-055.
NOTE : Minor chips and scratches may be smoothed out, but do not need to be stripped.

C. Wipe surface clean with Material No.P05-005 dampened with Material No.P11-014 Air dry.
WARNING : MIX POLYURETHANE COATING IN A WELL VENTILATED AREA. DO NOT ALLOW CONTACT WITH BARE SKIN.

D. Paint with Material No.P05-054, one coat in area shown in figure (Ref. Fig. 803, 804). Allow to dry.

E. Paint with Material No.P05-053, applying 5 crosscoats in area shown in figures (Ref. Fig. 803, 804). Allow to dry between coats.

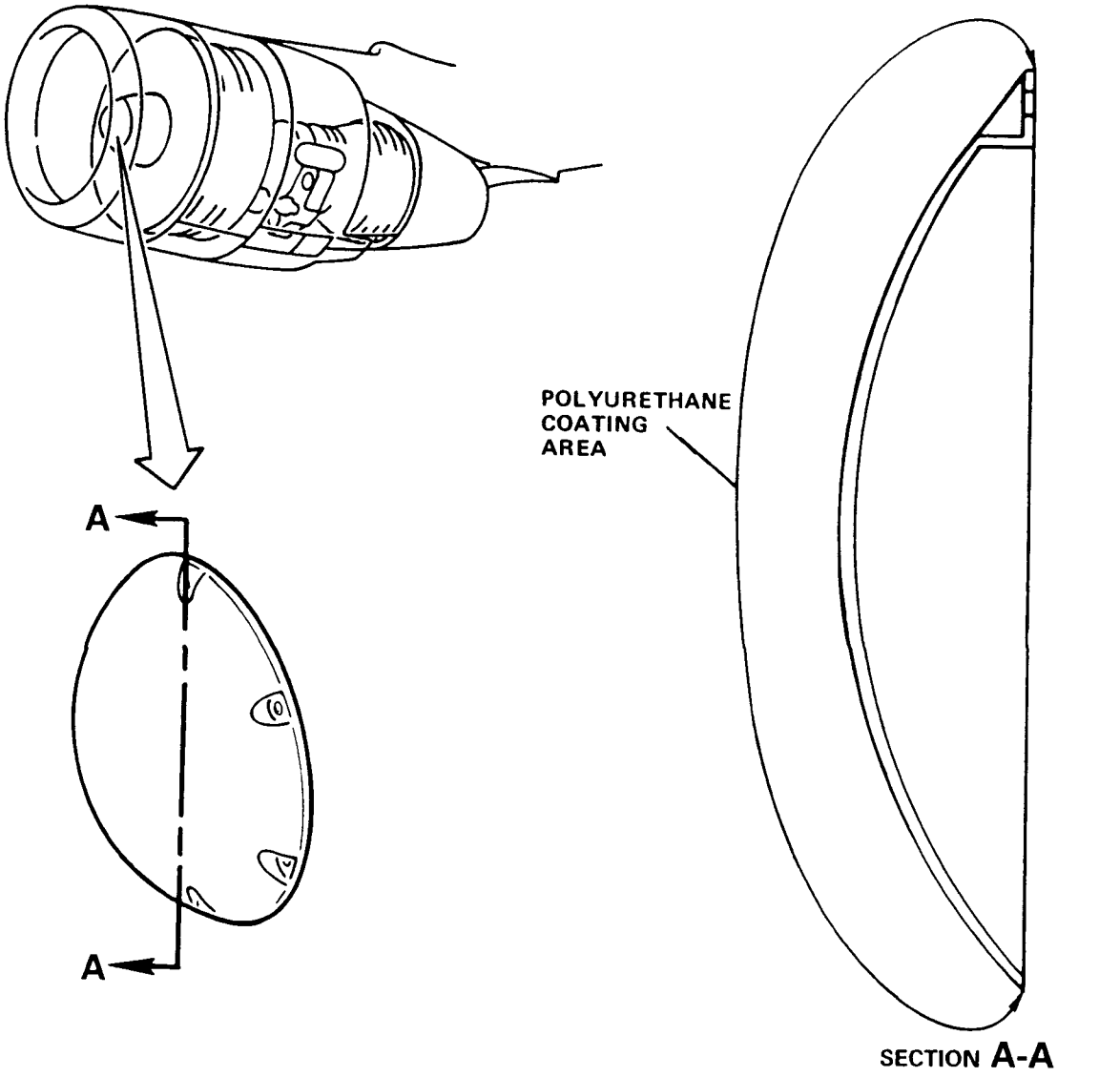
3. Repair Inlet Cone Surface Damage

A. Equipment and Materials

ITEM	DESIGNATION
A. Material No.P05-005	Special Materials (Ref. 70-00-00)
B. Material No.P05-056	Special Materials (Ref. 70-00-00)
C. Material No.P08-002	Bonding and Adhesive Compounds (Ref. 70-00-00)
D. Material No.P08-012	Bonding and Adhesive Compounds (Ref. 70-00-00)
E. Material No.P11-014	Cleaning Agents (Ref. 70-00-00)

B. Job Set-Up
(1)For removing paint from outside surface of area to be repaired, see paragraph 2.

C. Procedure (Ref. Fig. 805)
(1)Abrade exposed surface using Material No.P05-056 (Ref. Fig. 805)
(2)Wipe surface clean using Material No.P05-005, dampened with Material No.P11-014 and air dry.
(3)Prepare filling compound required as follows :
(a)At room temperature, mix 100 parts of Material No.P08-002 by weight with 25 parts of Material No.P08-012 by weight.
NOTE : Pot life of compound is 20-30 minutes at room temperature.
(4)Fill damaged area with prepared resin in such a manner so that the outside surface of filled area is slightly higher than adjacent parent material.



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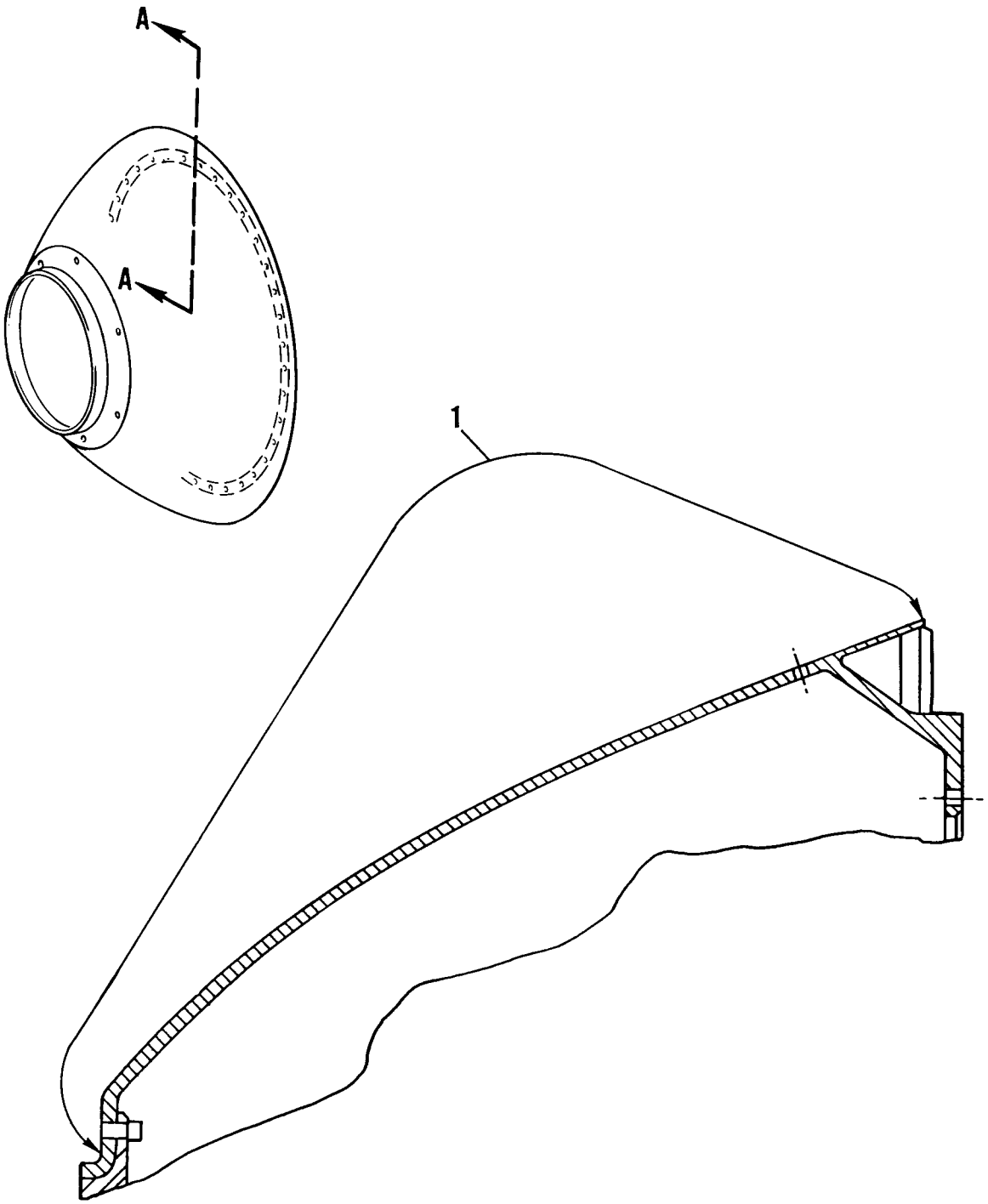
Repair of the Cone Front Segment
Figure 803



SECTION A-A

1. LAYER OF POLYURETHANE

L – A3778

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Repair of the Cone Rear Segment
Figure 804

(5)Recontour to original part profile. (Ref. Fig. 805)
(6)Cure compound for four hours at 175°F (79.4°C).

D. Close-Up
(1)For applying protective coating to repaired area, see paragraph 2.

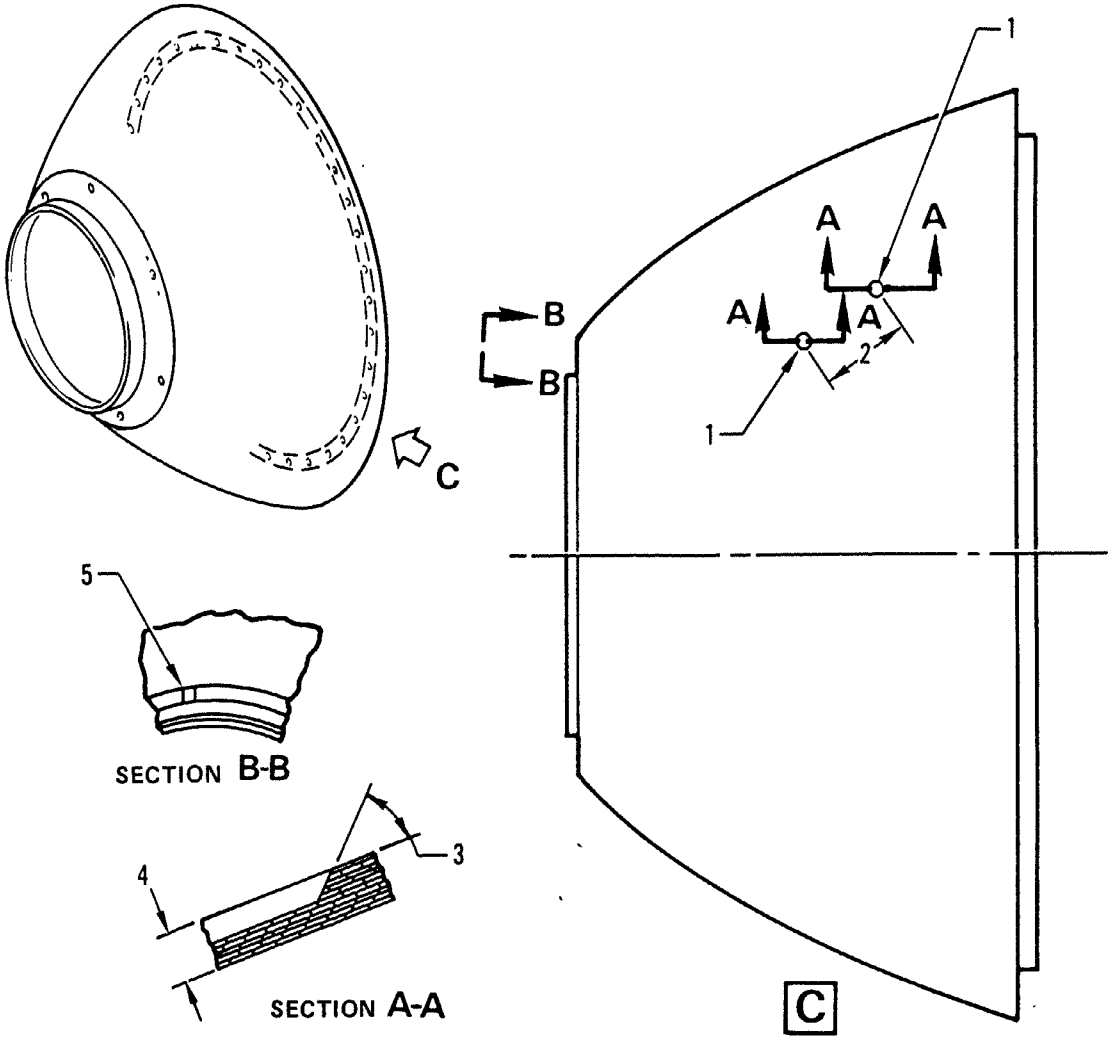
4. Repair Cone (Front) Segment Bolt Pocket Corner Damage

NOTE : This repair is temporary and the part must be replaced at next scheduled maintenance.

A. Equipment and Materials

	ITEM	DESIGNATION
	A.	Brush
	B.	Pad
	C.	Trowel
	D. Material No.P05-005	Special Materials (Ref. 70-00-00)
R	E. Material No.P05-053	Special Materials (Ref. 70-00-00)
R	F. Material No.P05-054	Special Materials (Ref. 70-00-00)
R	G. Material No.P05-094	Special Materials (Ref. 70-00-00)
R	H. Material No.P05-153	Special Materials (Ref. 70-00-00)
R	J. Material No.P05-253	Special Materials (Ref. 70-00-00)
R	K. Material No.P05-370	Special Materials (Ref. 70-00-00)
R	L. Material No.P05-371	Special Materials (Ref. 70-00-00)
R	M. Material No.P05-372	Special Materials (Ref. 70-00-00)
R	N. Material No.P11-014A	Cleaning Agents (Ref. 70-00-00)
	Referenced Procedure - 70-00-00, P. Block 201	Engine - Standard Practices

B. Procedure (Ref. Fig. 806)
(1)Clean the damaged area as follows :
(a)Clean the area by SPOP 209 (Ref. 70-00-00, P. Block 201).
(b)If necessary, use a soft non-metallic brush or pad.
R (c)Dry with clean Lint-Free Cotton Cloth (Material No.P05-005).
R (2)Lightly abrade the repair area with Aluminum Oxide Paper (Material
R No.P05-094) or Silicone Carbide Abrasive Paper (Material No.P05-153) or
R Abrasive Paper (Material No.P05-253) being careful not to damage the Kevlar layers under the fiberglass.
R (a)Clean by SPOP 208 (Ref. 70-00-00, P. Block 201) using Isopropyl Alcohol
R (Material No.P011-014A).
(b)Let air dry for 30 minutes minimum.
R NOTE : Alcohol which has not completely dried prevents proper coating
R cure.
R CAUTION : FOR FRONT INLET CONE WITH POLYURETHANE COATING. SEE
R ILLUSTRATED PARTS CATALOG (72-31-00/1/1).
R (3)Apply the urethane coating to the repair area as follows :
R NOTE : Keep away from bolt head imprint.
R (a)Paint with Polyurethane Coating (Material No.P05-054).
R Apply one coat to the required areas. Allow to dry for 5 to 6 minutes.



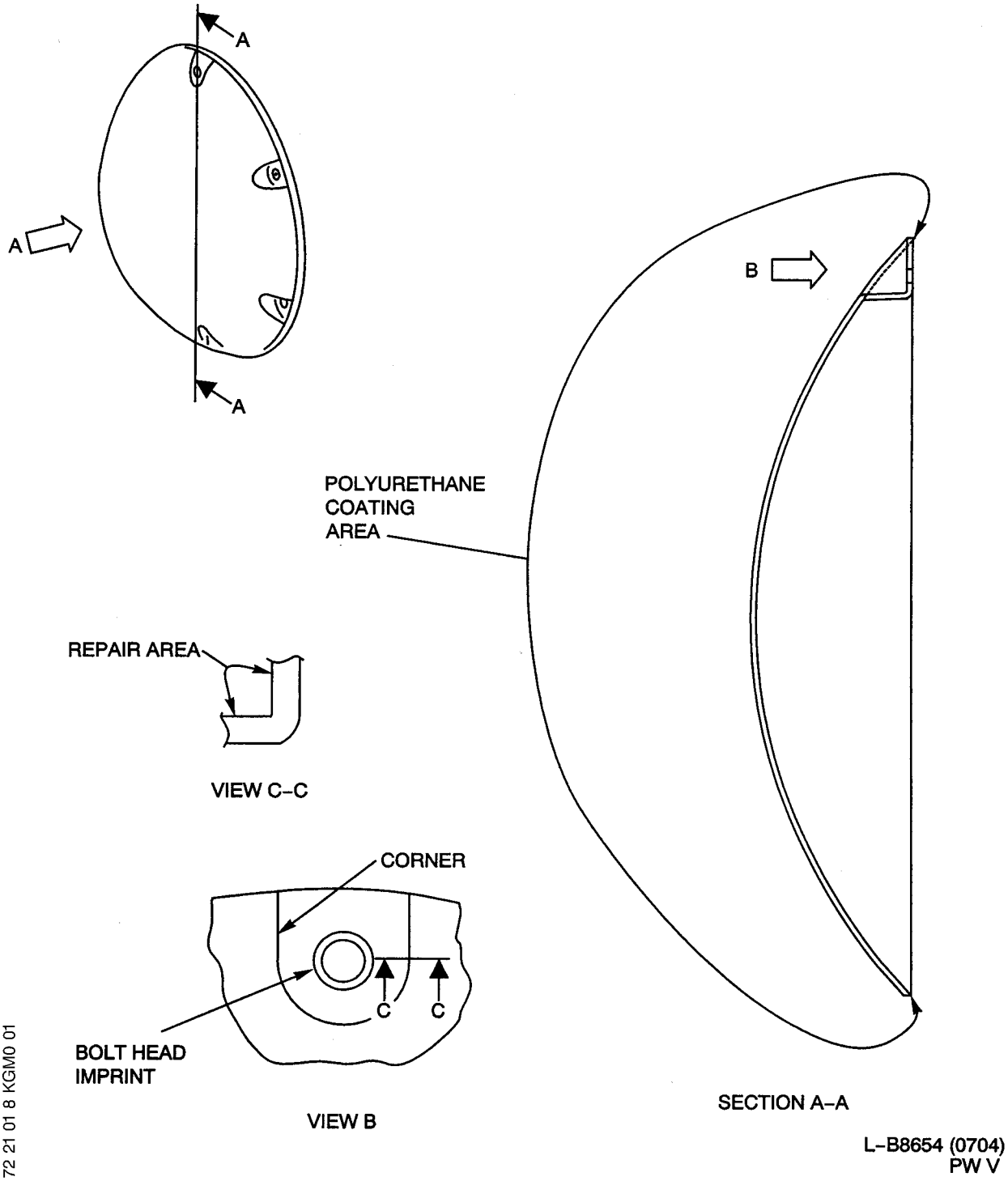
BM5 72 21 01 8 KEMO - 24 - 19
DM5

1. CHIP OR DENT
2. 3.000 IN. (76.200 MM) MINIMUM MEASURMENT BETWEEN ADJACENT REPAIRS IN ANY DIRECTION IF MORE THAN ONE - HALF MAXIMUM ALLOWABLE DEPTH OF 0.030 IN. (0.762 MM)
3. 30 - 50 DEGREES
4. SAME THICKNESS AS SURROUNDING AREA
5. TYPICAL TOOL IMPRESSION ON SURFACE

L-A3793

Surface Damage Repair
Figure 805

R (b)Paint with Polyurethane Coating (Material No.P05-053).
R Apply five coats minimum in areas shown. Allow to dry between coats for
R 5 to 6 minutes.
R (c)Apply sufficient layers to make the damaged area flush to 0.010 in.
R (0.254 mm) above the adjacent undamaged coating.
R CAUTION : FOR FRONT INLET CONE WITH FLUOROELASTOMER COATING. SEE
R ILLUSTRATED PARTS CATALOG (72-31-00/1/1).
R (4)Mix the Fluoroelastomer Protective Coating (Material No.P05-370) or
R Fluoroelastomer Protective Coating (Material No.P05-371) by the
R manufacturers recommended directions.
R (a)Be careful not to introduce air into the mixed coating.
R (b)Let the mixture stay for a minimum of 10 minutes before use. For ease
R of application, mixture may be reduced using MIBK.
R NOTE : Fluoroelastomer Protective Coating (Material No.P05-372) is
R paste and can be used in place of Fluoroelastomer Protective
R Coating (Material No.P05-370) or Fluoroelastomer Protective
R Coating (Material No.P05-371). Fluoroelastomer Protective
R Coating (Material No.P05-372) accumulates thickness quickly
R (thickening will occur when applied less number of times).
R (5)Use a brush to apply the coating by the manufacturers recommended
R directions.
R (6)Apply sufficient layers to make the damaged area flush to 0.010 in.
R (0.254 mm) above the adjacent undamaged coating. Allow to dry for 5
R minutes minimum between coats.
R (7)Let the coat dry in air for 2 hours minimum at room temperature 60 to
R 90 deg.F (16 to 32 deg.C) to let the release of volatiles. Increase the
R temperature to 150 to 170 deg.F (66 to 77 deg.C) and hold for 2 hours
R minimum.



Cone (Front) Segment Bolt Pocket Repair
Figure 806

R

1. Lubricate the Mid-Span shrouds of the Blades

A. Equipment and Materials

ITEM	DESIGNATION
A. P06-003 or	Lubricants (Ref. 70-00-00)
B. P06-005	Lubricants (Ref. 70-00-00)

NOTE : Material No.P06-005 in liquid paste is recommended over spray type. It is superior in effectiveness because it is more durable, more concentrated, and easier to restrict to shroud contact surface preventing overspray to airfoil surfaces.

NOTE : Material No.P06-003 is an acceptable substitute for Material No.P06-005. If both are available preference should be given to the use of Material No.P06-005.

B. Job Set-Up

(1)Open, safety and tag the following circuit breakers :

PANEL	SERVICE	IDENT.	LOCATION
133VU	ENGINES/ENG 1 & 2/START/CTL & WARM	1KG	335/R68

C. Procedure

(1)From inside the inlet, separate the fan blade shrouds at the twelve o'clock location to obtain the maximum gap or clearance. This is accomplished by pushing one blade rearward in the blade slot at twelve o'clock and pulling the adjacent blade forward. (Ref. Fig. 201).

NOTE : The maximum gap is 0.250 in. (6.35 mm) approx. for phase 1 fan rotor and 0.060 in. (1.52 mm) for phase 3 or hybrid 1C/1E fan rotor.

(2)Tight shrouds may be freed by hitting the blade with the palm of the hand. If the shrouds are still too tight, you may use a soft rubber mallet and tap the thick portion of the shroud.

(3)Use one of the methods that follow to lubricate the mid-span shrouds of the blades.

WARNING : DO NOT PERMIT THE MATERIAL No.P06-005 TO TOUCH YOUR SKIN. IF IT DOES, WASH IMMEDIATELY WITH SOAP AND WATER.

(a)With a brush, apply Material No.P06-005 to the contact faces of the mid-span shrouds of the blades. Wait five minutes before you install the blades.

(b)With a brush, apply Material No.P06-003 to the contact faces of the mid-span shrouds of the blades. The cure requirement is waived.

NOTE : No drying time is required.

(4)Wipe off any excess lubrication compound from the shroud outer surfaces or blade airfoil.

(5)Repeat the procedure for each shroud contact surface by slowly rotating

the fan rotor one blade at a time.

D. Close-Up
(1)Remove safety clips and tags and close circuit breakers 1KG.

2. Lubrication of the Stage 1 LPC (Fan) Blade Roots to Reduce N1 Vibration

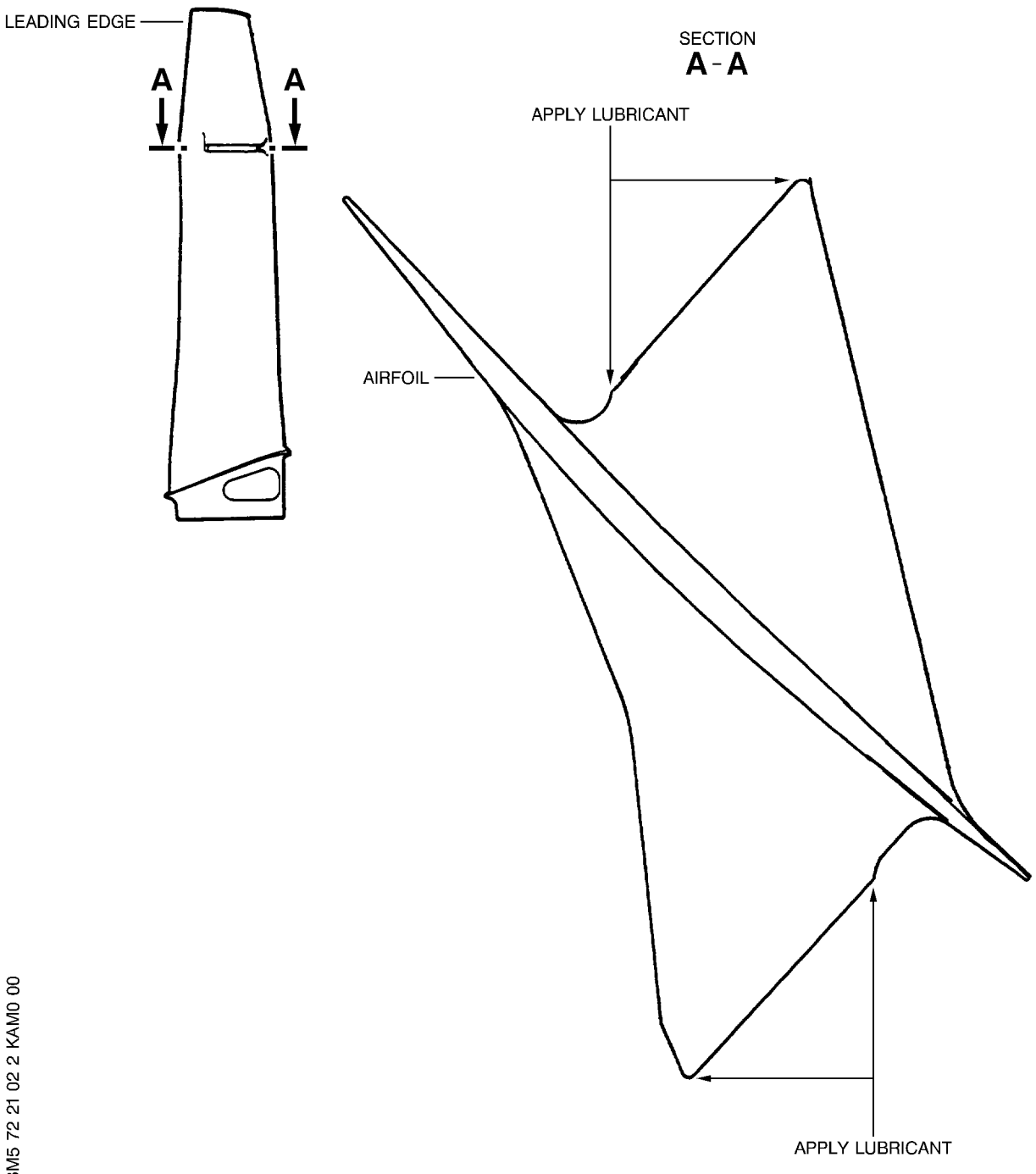
A. General
(1)This procedure is used to decrease a small quantity of N1 rotor unbalance that is not stable. This type of vibration changes from engine run to engine run at the same N1 speeds.
(2)If the low rotor (N1) vibration is not stable, lubrication of the fan blade roots (dovetail areas) can be necessary.
(3)You can use Lubricant (Material No.P06-005) (brush on) or Antigallant Compound (Material No.P06-044) (spray on).
If you use Antigallant Compound (Material No.P06-044), you must let the compound cure for 4 hours before you can install the fan blades to the hub.

B. Equipment and Materials

ITEM	DESIGNATION
(1)P06-005	Lubricants (Ref. 70-00-00) Optional to P06-044)
(2)P06-044	Lubricants (Ref. 70-00-00) Optional to P06-005)
(3)	Brush (for Application of Lubricant P06-005)
Referenced Procedures	
- 70-00-00, P. Block 201	Engine
- 71-00-00, P. Block 501	Power Plant - General
- 72-21-01, P. Block 401	Inlet Cone
- 72-21-02, P. Block 401	First Stage Compressor Rotor (Fan) Blade Assembly

C. Procedure to Lubricate the Fan Blade Roots to Reduce N1 Vibration
(1)Remove the inlet cone (Ref. 72-21-01, P. Block 401).
CAUTION : YOU MUST REMOVE THE FAN BLADES TO APPLY THE LUBRICANT CORRECTLY. IF YOU DO NOT, YOU CAN MAKE THE VIBRATION WORSE.
(2)Remove the LPC 1st stage fan blades (Ref. 72-21-02, P. Block 401).

D. Lubrication of the Fan Blade Roots to Reduce N1 Vibration (Ref. Fig. 202)
NOTE : If you use Antigallant Compound (Material No.P06-044), you must remove the complete set of fan blades so that the compound can cure before reinstallation.
If you use Lubricant (Material No.P06-005), you can remove one fan blade at a time, apply the lubricant, and reinstall the fan blade without a cure time.
(1)Apply Lubricant (Material No.P06-005) to each fan blade root as follows :
NOTE : No cure time is necessary.
(a)Remove the No.1 fan blade from the hub.
(b)Use a cloth and remove any dirt or grit from the fan blade root area and the hub blade slot.



Mid-span shrouds Lubrication
Figure 201

NOTE : You can use SPOP 208 as an option to the dry cloth wipe procedure (Ref. 70-00-00, P. Block 201).

1 Do not try to remove the existing coating.

2 Do not try to polish the metal.

(c)Use a brush and apply the lubricant to the dovetail area only of the fan blade root.

1 Do not apply lubricant to the fan hub slots.

2 Do not apply lubricant to the fan blade fairing seal areas (flow path lines).

3 Do not apply lubricant to the bottom face of the fan blade root.

4 Some lubricant is permitted on the area between the dovetail area and the flow path line.

5 Lubricant is not permitted on the seal area (flow path line) or the bottom face of the root.

6 Remove excess lubricant.

(d)Install the No.1 fan blade to the hub.

(e)Continue to remove, lubricate and install all of the remaining fan blades one at a time.

(2)Apply Antigallant Compound (Material No.P06-044) to each fan blade root as follows :

NOTE : A 4 hour cure time is necessary.

(a)Make sure all the fan blades are marked with the location numbers and removed from the hub.

(b)Use a cloth and remove any dirt or grit from the fan blade root areas and the fan hub slots.

NOTE : You can use SPOP 208 as an option to the dry cloth wipe procedure (Ref. 70-00-00, P. Block 201).

1 Do not try to remove the existing coating.

2 Do not try to polish the metal.

(c)For each fan blade, use the spray-on antigallant compound to lubricate the dovetail area only of the fan blade root.

1 Do not apply compound to the fan hub slots.

2 Do not apply compound to the fan blade fairing seal areas (flow path lines).

3 Do not apply compound to the bottom face of the fan blade root.

4 Some compound is permitted on the area between the dovetail area and the flow path line.

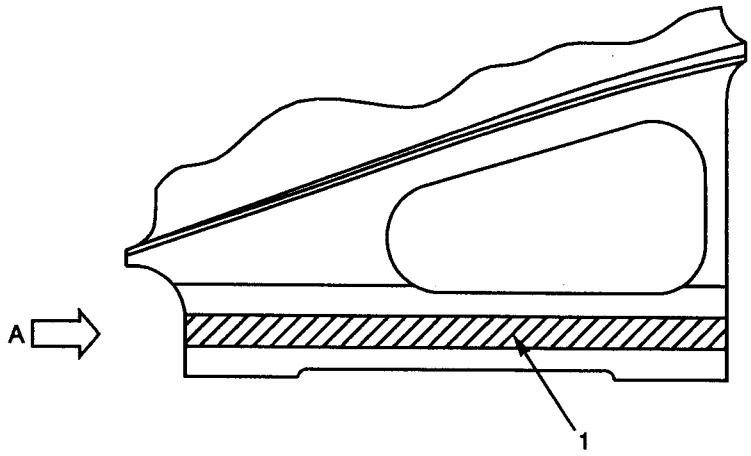
5 Compound is not permitted on the seal area (flow path line) or the bottom face of the root.

(d)Let the compound cure for 4 hours minimum before you install the fan blades.

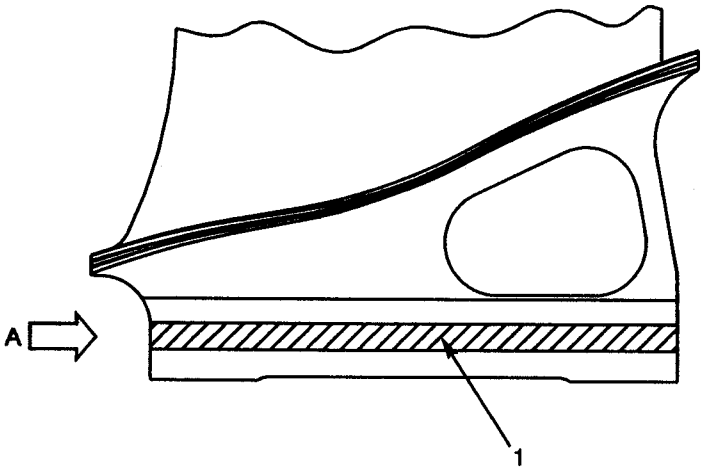
(3)Install the LPC 1st stage fan blades (Ref. 72-21-02, P. Block 401).

(4)Install the inlet cone (Ref. 72-21-01, P. Block 401).

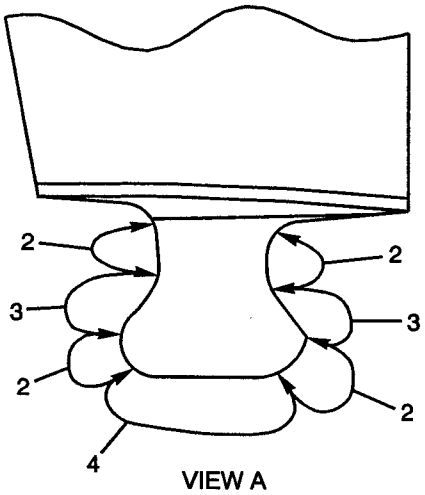
(5)Do the test No.8 - Vibration Survey (Ref. 71-00-00, P. Block 501).



PN'S 52A121, 52A121-001,
53A321, 56A511, AND 56A821



PN'S 54A821 AND 56A621



VIEW A

1. BLADE ROOT APPLICATION AREA
2. A SMALL QUANTITY OF LUBRICATION IS PERMITTED IN THIS AREA
3. LUBRICATION IS APPLIED TO THIS AREA
4. NO LUBRICATION IS PERMITTED IN THIS AREA

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L-B8287 (0800)
PW V

Fan Blade Root (Dovetail) Lubrication
Figure 202

FIRST STAGE COMPRESSOR ROTOR (FAN) BLADE ASSEMBLY - REMOVAL/INSTALLATION

1. Individual or a Matched Moment Weighed Set of Stage 1 LPC (Fan) Blades

A. General

CAUTION : INTERMIX OF FAN BLADE/THRUST REVERSER MAY RESULT IN A REDUCTION OF AVAILABLE FRONT COMPRESSOR SURGE MARGIN AND FAN STALL MARGIN WHICH COULD AGGRAVATE FAN BLADE FRACTURE AND SURGE PROBLEMS. TSFC CAN ALSO BE AFFECTED BY MIXING FAN BLADE/THRUST REVERSER CONFIGURATIONS.

(1)Prior to Replacing the Fan Blade Assembly (Ref. 71-00-10, P. Block 201)

B. Equipment and Materials

ITEM	DESIGNATION
A. PWA85035	Fixture, Support
B. PWA88617	Compressor, Lock (Two Necessary) (Optional to PWA102828)
C. PWA102828	Compressor, Mechanical
D. PWA86651	Cart, Storage
E. Material No.P05-045	Special Materials (Ref. 70-00-00)
R F. Material No.P06-005	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant-General
- 71-00-10, P. Block 201	Engine Component Intermix
- 72-21-01, P. Block 401	Inlet Cone

C. Job Set-Up

Remove inlet cone (Ref. 72-21-01, P. Block 401).

D. Remove Individual or a Matched Moment Weighed Set of Stage 1 LPC (Fan) Blades (Ref. Fig. 401, 402, 403)

NOTE : Following procedure provides for removal of blades for selective replacement purposes. See paragraph 2.D. for removal of blades as a complete set.

WARNING : TO AVOID POSSIBLE INJURY TO HANDS, GLOVES SHOULD BE WORN WHEN HANDLING FAN BLADES.

CAUTION : DO NOT LEAVE ENGINE UNATTENDED WITHOUT BLADE LOCK INSTALLED. IF ENGINE WINDMILLS WITH FAN BLADES IN FORWARD POSITION, BLADES COULD BE DAMAGED.

(1)Remove the fan blades from the compressor hub as follows.

(a)Remove the fan blade lock assembly with PWA88617 Lock Compressors or PWA102828 Mechanical Compressor.

(b)If you use PWA88617 Lock Compressors do the following (Ref. Fig. 401) (Sheet 1/2).

1 Install the compressor clamp over the front flange and against the front face of the LPC hub (put one of the clamps near the lock split). At the same time, the foot should be positioned at the OD of the

blade lock.
2 Turn the hex head cap screw to compress the blade lock.
3 Position the second lock compressor as required to remove the blade lock.
CAUTION : DO NOT USE METAL TOOLS WHEN TRYING TO REMOVE THE BLADE LOCK FROM THE HUB. METAL TOOLS WILL DAMAGE THE HUB. USE THE PLASTIC WEDGE TO HELP PULL THE BLADE LOCK FROM THE FAN HUB.
4 Use the PWA88617 Wedge to help remove the blade lock from the hub.
(c)If you use PWA102828 Mechanical Compressor do the following (Ref. Fig. 401) (Sheet 2/2).
NOTE : Turn the hub clockwise and tap the blade roots with a rubber mallet to decrease the forward force on the lock.
1 Put the stationary jaw of the mechanical compressor between the lugs of the hub near the split of the blade lock so the jaw touches the outside diameter of the blade lock.
2 Put the movable jaw of the mechanical compressor against the inside tab of the hub.
3 Squeeze the handles of the mechanical compressor to disengage the blade lock from the hub groove.
CAUTION : DO NOT USE METAL TOOLS WHEN TRYING TO REMOVE THE BLADE LOCK FROM THE HUB. METAL TOOLS WILL DAMAGE THE HUB. USE THE PLASTIC WEDGE TO HELP PULL THE BLADE LOCK FROM THE FAN HUB.
4 Insert the PWA102828 Wedge under the blade lock to hold it out of the hub groove.
5 Continue to relocate the mechanical compressor and wedge to the next radial location around the hub to remove the blade lock from the hub.
(2)Turn rotor to locate blade to be removed to 12 o'clock position.
(3)Install PWA85035 Support Fixture to hub and secure with bolts.
CAUTION : WHEN REMOVING FAN BLADE(S), USE CARE TO AVOID DAMAGE TO RUBBER SEAL BONDED TO BOTTOM OF FAN BLADE PLATFORM.
(4)To prevent fan blade shroud and root binding during blade removal, proceed as follows:
(a)Position each fan blade at 12 o'clock position.
(b)Working in a counterclockwise direction (as viewed from the front) carefully pull each blade forward, in hub slot, in small increments.
(c)Continue sliding all blades forward, one at a time, at 12 o'clock position, until stopped by fixture.
(d)Blade at 12 o'clock position should then be free to slide completely out of slot.
(e)Rotate cut-out in fixture to line up with blade to be removed at 12 o'clock position.
(5)Remove selected blade.
(6)If replacing matched moment weighed blade set :
(a)Turn rotor 180 degrees.
(b)Rotate ring assembly until cutout in ring lines up with blade to be removed.
(c)Remove blade located 180 degrees from previously removed blade.

E. Install Individual or a Matched Moment Weighed Set of Stage 1 LPC (Fan) Blades (Ref. Fig. 401, 402, 403)
(Ref. Fig. 404)

NOTE : Following procedure provides for installation of blades for selective replacement purposes. See paragraph 2.E. for installation of blades as a complete set.

(1)Select blades as follows :

CAUTION : FAN BLADES WITH DIFFERENT PART NUMBERS ARE INTERCHANGEABLE PER SERVICE BULLETIN PW4ENG 72-132, BUT MOMENT WEIGHT PAIRS OF THE SAME PART NUMBER MUST BE MAINTAINED. A MIXTURE OF DIFFERENT PART NUMBERS MUST BE KEPT AT A MINIMUM. LIMIT FOR MINIMUM QUANTITY OF MIXED PART NUMBERS IS NOT REQUIRED IF ENGINE HAS COMMON DATA ENTRY PLUG WHICH INCORPORATED PW4 ENG 73-78 OR PW4 ENG 73-79. IF POSSIBLE, ALL THE SAME PART NUMBER FAN BLADES ARE TO BE INSTALLED.

NOTE : Blade replacement may be accomplished using single blades selected by moment weight or by using matched set. When replacing matched set, rotor must have been previously assembled on matched set basis.

(a)When replacing a moment weight set of fan blades, installation of each blade must be 180 degrees apart. Two moment weight blades must be paired by matching like moment weights within 1.0 oz. in. (720 g.mm).

(b)When replacing one blade in a full rotor set, the replacement blade must be within 1.0 oz. in. (720 g.mm) of the 180 degree opposite moment weight blade.

(c)Make a temporary mark with a marker (Material No.P05-045).

NOTE : Blade moment weight markings are found on concave side of blade airfoil section (Ref. Fig. 403).

(d)If two or more blended blades are grouped together, then blended blades and their matching blades should be evenly distributed around hub. Unless this process can be successfully completed a vibration check is recommended.

R (2)Apply compound to the mid-span shrouds and blade roots of the blades with the method that follows :

R WARNING : DO NOT PERMIT THE COMPOUND (MATERIAL No.P06-005) TO TOUCH YOUR SKIN. IF IT DOES, WASH IMMEDIATELY WITH SOAP AND WATER.

R (a)With a brush, apply Material No.P06-005 to the contact faces of the
R mid-span shrouds of the blades.

R (b)With a brush, apply Material No.P06-005 to the dove tail area of the
R fan blade root. Do not apply compound to the fan hub slots or bottom face of the fan blade root. Some lubricant is permitted on the area between the dove tail area and platform (Ref. Fig. 404).

(3)Position rotor (with support fixture in place) to locate empty blade slot at 12 o'clock position.

(4)Ensure that blades are positioned forward in slots until stopped by fixture.

CAUTION : WHEN INSTALLING FAN BLADE(S), USE CARE TO AVOID DAMAGE TO RUBBER SEAL BONDED TO BOTTOM OF FAN BLADE PLATFORM.

(5)To prevent fan blade shroud and root binding during blade installation, proceed as follows:

(a)Install replacement blade(s).

(b)Position each fan blade at 12 o'clock position.

(c)Working in a clockwise direction (as viewed from the front), carefully

push each blade rearward, into hub slot, in small increments.
(d)Continue sliding all blades rearward, one at a time, at 12 o'clock position, until seated.
(6)If replacing matched moment weighed set :
(a)Install replacement blade at the 12 O'clock position.
(b)Turn rotor 180 degrees to position empty blade slot at 12 o'clock position.
(c)Reposition support fixture and install second blade. Repeat above installation procedure (Steps (4)(c) and (4)(d)).
(7)Remove support fixture from hub flange.
(8)Install blade lock as follows :
(a)Position lock to align anti-rotation pin of lock with anti-rotation slot of hub.
(b)Install lock starting at lock joint.
(c)Seat lock using fiber drift.
(d)Make sure the lock is correctly installed by measurement of the gap between the lock ends. The gap must be 0.010 - 0.060 in. (0.25 - 1.52 mm). If you can not get the correct gap measurement, you must make sure the lock is fully seated.

F. Close-Up
(1)Install inlet cone (Ref. 72-21-01, P. Block 401).
(2)Test engine as per Test Reference Table (Ref. 71-00-00, P. Block 501).

2. All Stage 1 LPC (Fan) Blades

A. General
CAUTION : INTERMIX OF FAN BLADE/THRUST REVERSER MAY RESULT IN A REDUCTION OF AVAILABLE FRONT COMPRESSOR SURGE MARGIN AND FAN STALL MARGIN WHICH COULD AGGRAVATE FAN BLADE FRACTURE AND SURGE PROBLEMS. TSFC CAN ALSO BE AFFECTED BY MIXING FAN BLADE/THRUST REVERSER CONFIGURATIONS.

(1)Prior to Replacing the Fan Blade Assembly (Ref. 71-00-10, P. Block 201)

B. Equipment and Materials

ITEM	DESIGNATION
A. PWA85035	Fixture, Support
B. PWA86651	Cart, Storage
C. PWA88617	Compressor, Lock (Two Necessary) (Optional to PWA102828)
D. PWA102828	Compressor, Mechanical
E. Material No.P05-045	Special Materials (Ref. 70-00-00)
R F. Material No.P06-005	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant-General
- 71-00-10, P. Block 201	Engine Component Intermix
- 72-21-01, P. Block 401	Inlet Cone

C. Job Set-Up
Remove inlet cone (Ref. 72-21-01, P. Block 401).

D. Remove all Stage 1 LPC (Fan) Blades (Ref. Fig. 401, 402) (Ref. Fig. 403)

NOTE : Following procedure provides for removal of blades as a complete set. For selective blade replacement requirements, see paragraph 1.D.

WARNING : TO AVOID POSSIBLE INJURY TO HANDS, GLOVES SHOULD BE WORN WHEN HANDLING FAN BLADES.

CAUTION : DO NOT LEAVE ENGINE UNATTENDED WITHOUT BLADE LOCK INSTALLED. IF ENGINE WINDMILLS WITH BLADES IN FORWARD POSITION, BLADES COULD BE DAMAGED.

(1)Remove the fan blades from the compressor hub as follows.

(a)Remove the fan blade lock assembly with PWA88617 Lock Compressors or PWA102828 Mechanical Compressor.

(b)If you use PWA88617 Lock Compressors do the following (Ref. Fig. 401) (Sheet 1/2).

1 Install the compressor clamp over the front flange and against the front face of the LPC hub (put one of the clamps near the lock split). At the same time, the foot should be positioned at the OD of the blade lock.

2 Turn the hex head cap screw to compress the blade lock.

3 Position the second lock compressor as required to remove the blade lock.

CAUTION : DO NOT USE METAL TOOLS WHEN TRYING TO REMOVE THE BLADE LOCK FROM THE HUB. METAL TOOLS WILL DAMAGE THE HUB. USE THE PLASTIC WEDGE TO HELP PULL THE BLADE LOCK FROM THE FAN HUB.

4 Use the PWA88617 Wedge to help remove the blade lock from the hub.

(c)If you use PWA102828 Mechanical Compressor do the following (Ref. Fig. 401) (Sheet 2/2).

NOTE : Turn the hub clockwise and tap the blade roots with a rubber mallet to decrease the forward force on the lock.

1 Put the stationary jaw of the mechanical compressor between the lugs of the hub near the split of the blade lock so the jaw touches the outside diameter of the blade lock.

2 Put the movable jaw of the mechanical compressor against the inside tab of the hub.

3 Squeeze the handles of the mechanical compressor to disengage the blade lock from the hub groove.

CAUTION : DO NOT USE METAL TOOLS WHEN TRYING TO REMOVE THE BLADE LOCK FROM THE HUB. METAL TOOLS WILL DAMAGE THE HUB. USE THE PLASTIC WEDGE TO HELP PULL THE BLADE LOCK FROM THE FAN HUB.

4 Insert the PWA102828 Wedge under the blade lock to hold it out of the hub groove.

5 Continue to relocate the mechanical compressor and wedge to the next radial location around the hub to remove the blade lock from the hub.

(2)Install PWA85035 fixture to hub and secure with six fasteners equally spaced around hub. Rotate ring assembly until cut-out in ring lines up with blade to be removed at 12 o'clock location.

(3)Progressing in clockwise direction (as viewed from front), number blades

1 to 38 using Material No.P05-045, or equivalent.

(4)Mark corresponding hub slots with matching blade numbers.

CAUTION : WHEN REMOVING FAN BLADE(S), USE CARE TO AVOID DAMAGE TO RUBBER SEAL BONDED TO BOTTOM OF FAN BLADE PLATFORM.

(5)To prevent fan blade shroud and root binding during blade removal, proceed as follows :

(a)Position each fan blade at 12 o'clock position.

(b)Working in a counterclockwise direction (as viewed from the front), carefully pull each blade forward, in hub slot, in small increments.

(c)Continue sliding all blades forward, one at a time, at 12 o'clock position, until stopped by fixture.

(d)Blade at 12 o'clock position should then be free to slide completely out of slot.

(e)Rotate cut-out in fixture to line up with blade to be removed at 12 o'clock position.

NOTE : Inspect for missing fan blade moment weight only when the fan blades are removed. Any number of missing fan blade moment weights on any number of fan blades may continue in service until next shop visit provided prior engine operation showed vibration levels were within acceptable limits and fan blades are reinstalled in the same fan hub positions. If engine operation prior to fan blade removal was not within acceptable limits, missing fan blade moment weights may be cause of vibration.

(6)Install removed blades in PWA86651 Storage Cart to prevent damage.

E. Install all First Stage 1 LPC (Fan) Blades
(Ref. Fig. 401, 402, 403)

CAUTION : FAN BLADES WITH DIFFERENT PART NUMBERS ARE INTERCHANGEABLE PER SERVICE BULLETIN PW4ENG 72-132, BUT MOMENT WEIGHT PAIRS OF THE SAME PART NUMBER MUST BE MAINTAINED. A MIXTURE OF DIFFERENT PART NUMBERS MUST BE KEPT AT A MINIMUM. LIMIT FOR MINIMUM QUANTITY OF MIXED PART NUMBERS IS NOT REQUIRED IF ENGINE HAS COMMON DATA ENTRY PLUG WHICH INCORPORATED SB PW4ENG 73-78 OR PW4ENG 73-79. IF POSSIBLE, ALL THE SAME PART NUMBER FAN BLADES ARE TO BE INSTALLED.

NOTE : Following procedure provides for installation of blades as a complete set. See paragraph 1.E. for selective blade replacement requirements.

(1)Remove blades from storage cart and arrange blades in order, as previously numbered, or lay out blades in moment weighed sets. If necessary, number blades, with heaviest pair as 1 and 20, next heaviest as 2 and 21, next heaviest as 3 and 22, continuing to lightest matched set, 19 and 38. Temporary marks can be made with a marker (Material No.P05-045).

NOTE : Blade moment weight markings are located on concave side of blade airfoil section (Ref. Fig. 403).

R (2)Apply compound to the mid-span shrouds and blade roots of the blades with the method that follows :

R WARNING : DO NOT PERMIT THE COMPOUND (MATERIAL No.P06-005) TO TOUCH YOUR SKIN. IF IT DOES, WASH IMMEDIATELY WITH SOAP AND WATER.

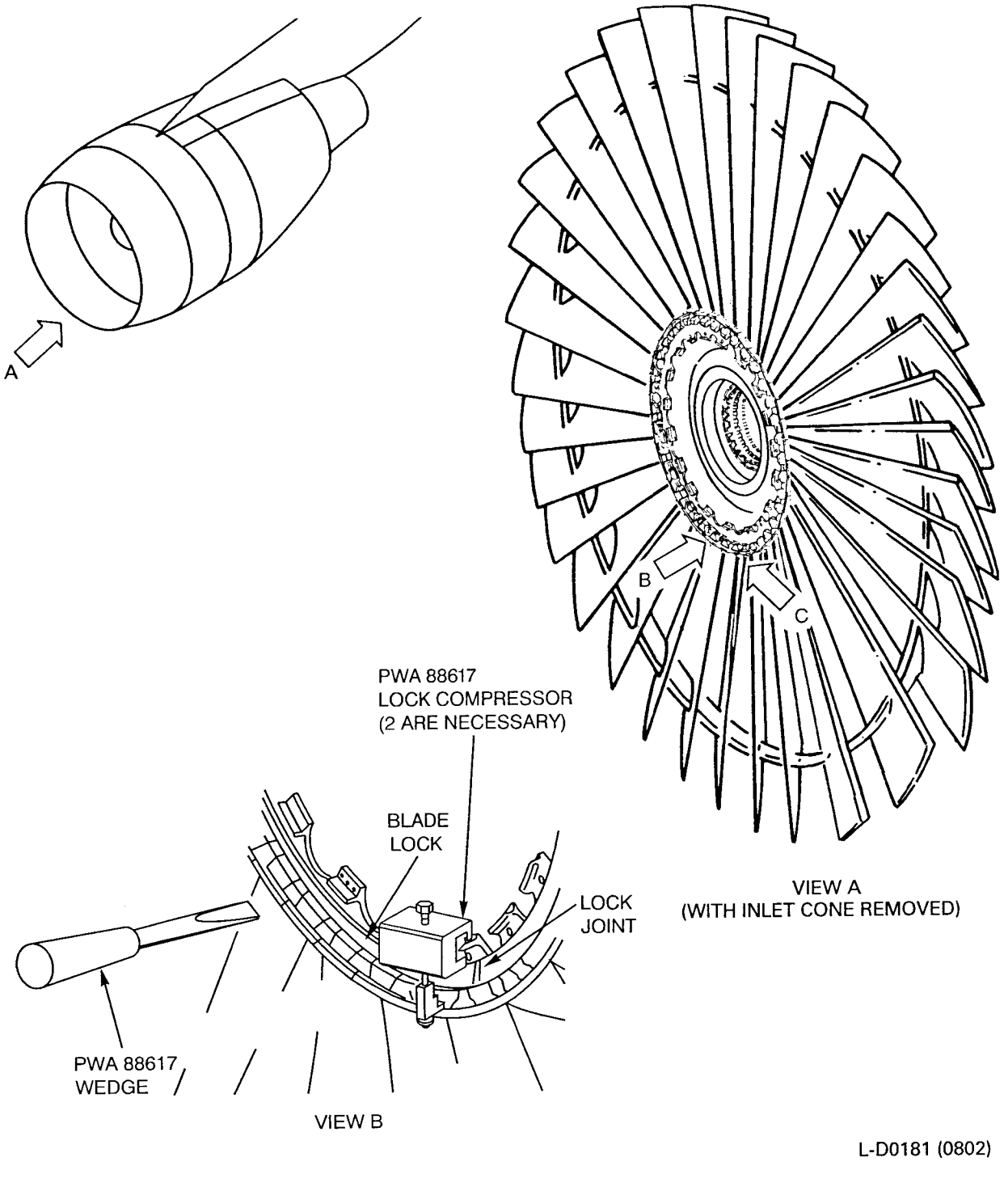
R (a)With a brush, apply Material No.P06-005 to the contact faces of the

R mid-span shrouds of the blades.
R (b)With a brush, apply Material No.P06-005 to the dove tail area of the
R fan blade root. Do not apply compound to the fan hub slots or bottom face of the fan blade root. Some lubricant is permitted on the area between the dove tail area and platform (Ref. Fig. 404).

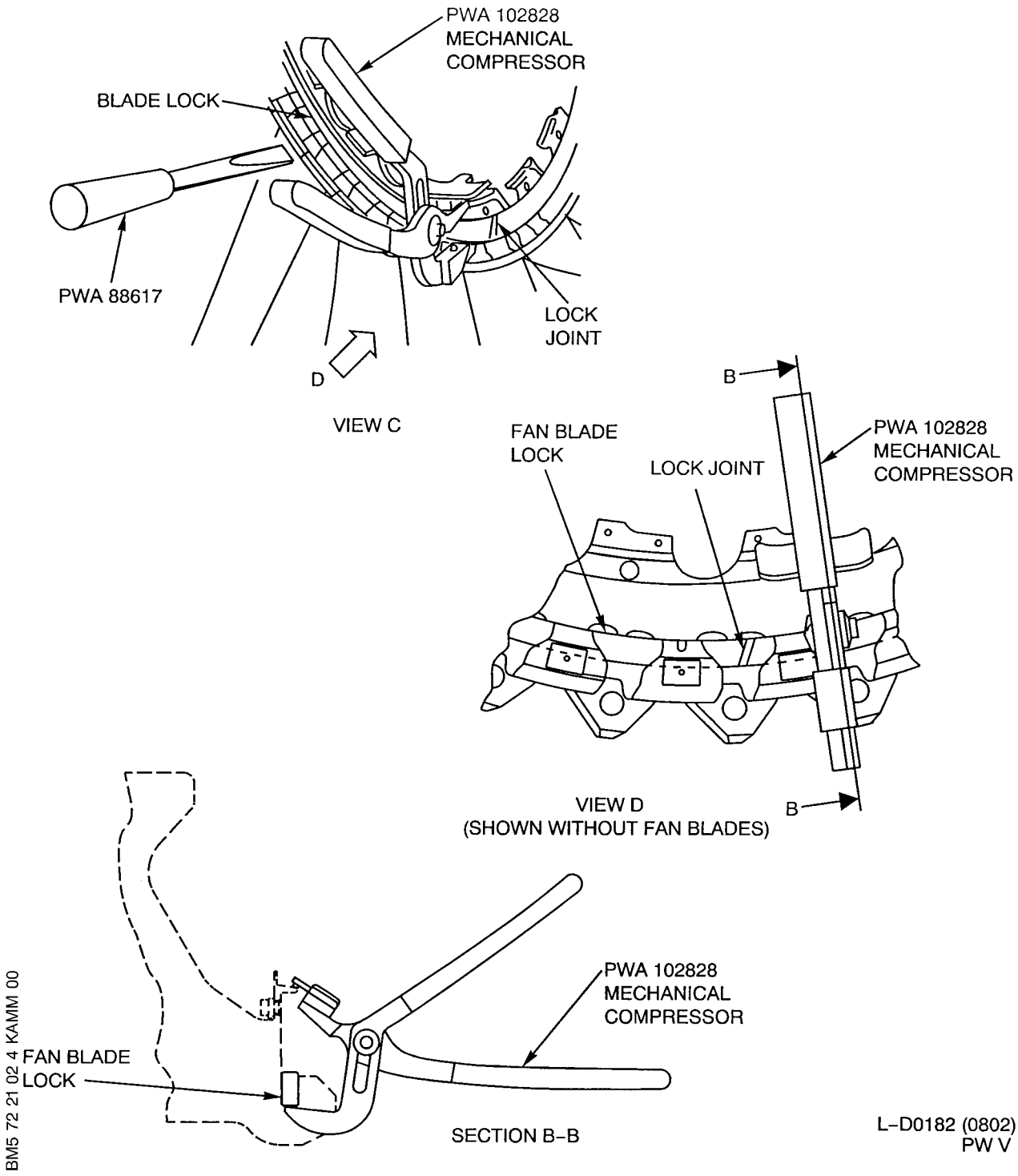
CAUTION : WHEN YOU INSTALL THE FAN BLADE(S), BE CAREFUL NOT TO DAMAGE THE RUBBER SEAL THAT IS BONDED TO THE BOTTOM OF THE FAN BLADE PLATFORM.

(3)Working in clockwise direction (as viewed from front), install blades in matching numbered blade slots, until last blade is ready for installation.
(4)Turn rotor to locate remaining open slot at 12 o'clock position and install last blade.
(5)To prevent fan blade shroud and root binding during blade installation, proceed as follows :
(a)Position each fan blade at 12 o'clock position.
(b)Working in a clockwise direction (as viewed from the front), carefully push each blade rearward, into hub slot, in small increments.
(c)Continue sliding all blades rearward, on at a time, at 12 o'clock position, until seated.
(d)Remove fixture from hub.
(6)Install blade lock assembly into slot in hub and blades as follows : (Ref. Fig. 401).
(a)Position lock to align anti-rotation pin of lock with anti-rotation slot of hub.
(b)Install lock, starting at lock joint.
(c)Seat lock using fiber drift.
(d)Make sure the lock is correctly installed by measurement of the gap between the lock ends. The gap must be 0.010 - 0.060 in. (0.25 - 1.52 mm). If you can not get the correct gap measurement, you must make sure the lock is fully seated.

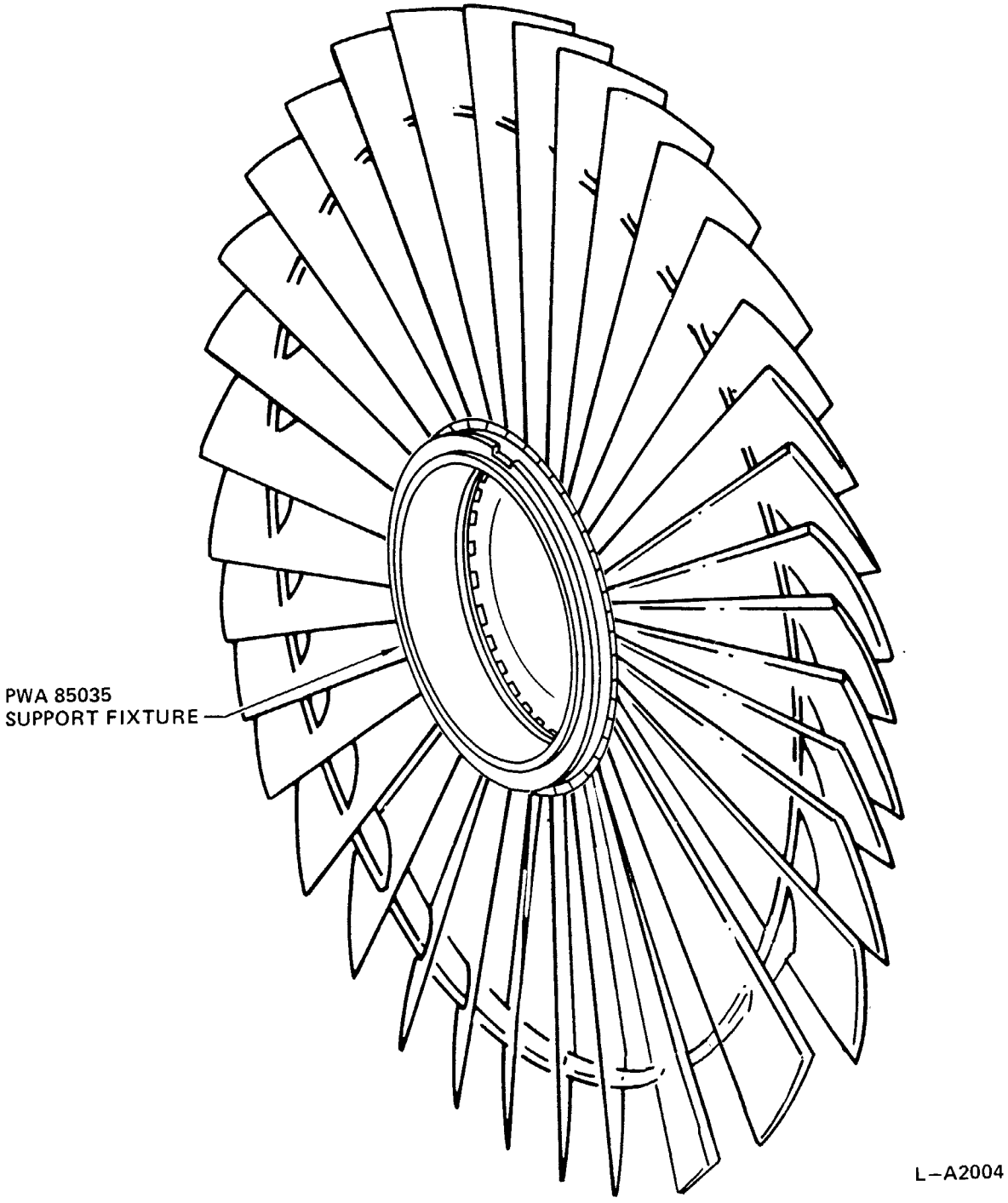
F. Close-Up
(1)Install inlet cone (Ref. 72-21-01, P. Block 401).
(2)Test engine as per Test Reference Table (Ref. 71-00-00, P. Block 501).



Stage 1 LPC (Fan) Blade Lock Removal
(Sheet 1)
Figure 401



Stage 1 LPC (Fan) Blade Lock Removal
(Sheet 2)
Figure 401



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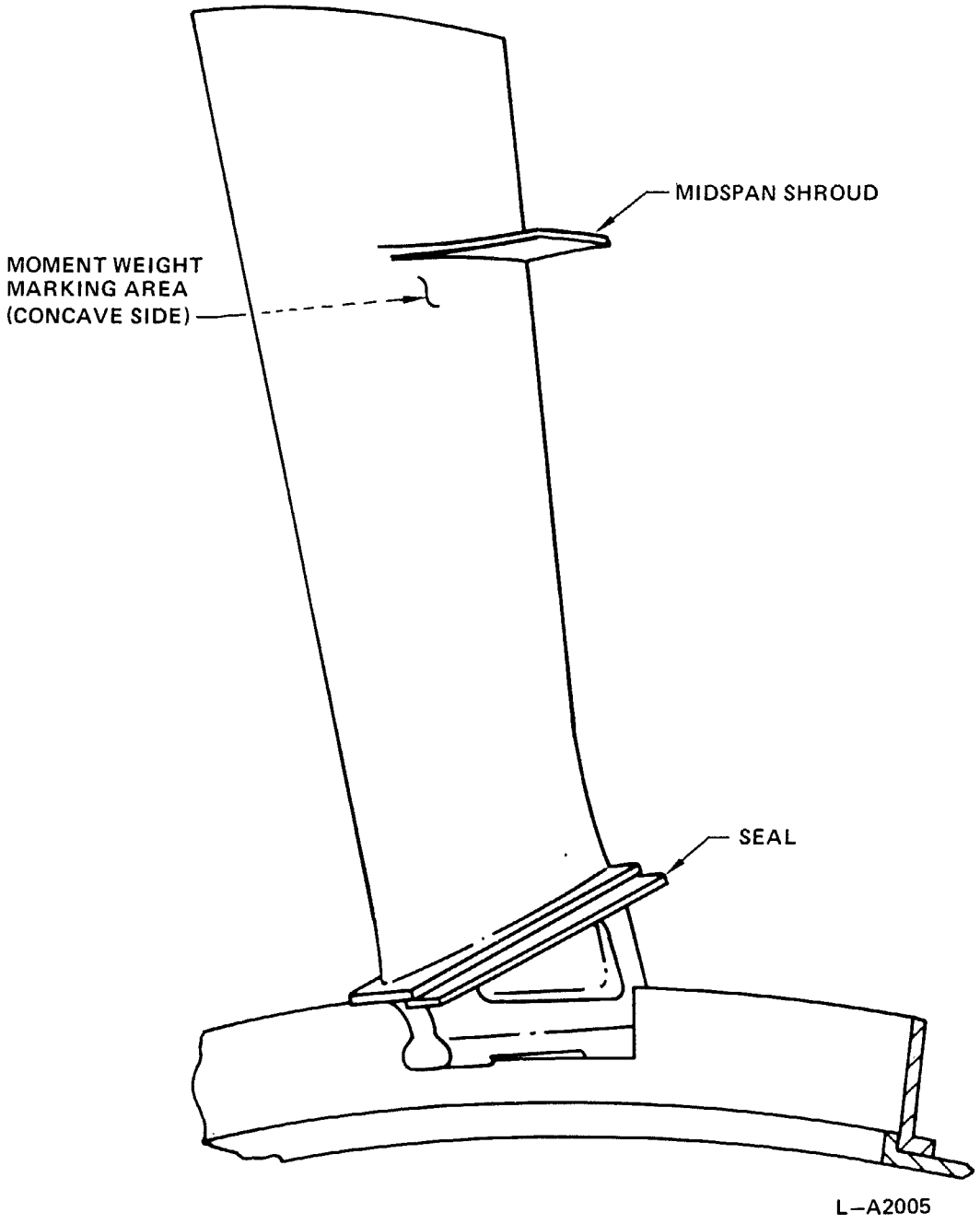
Support Fixture Installed
Figure 402



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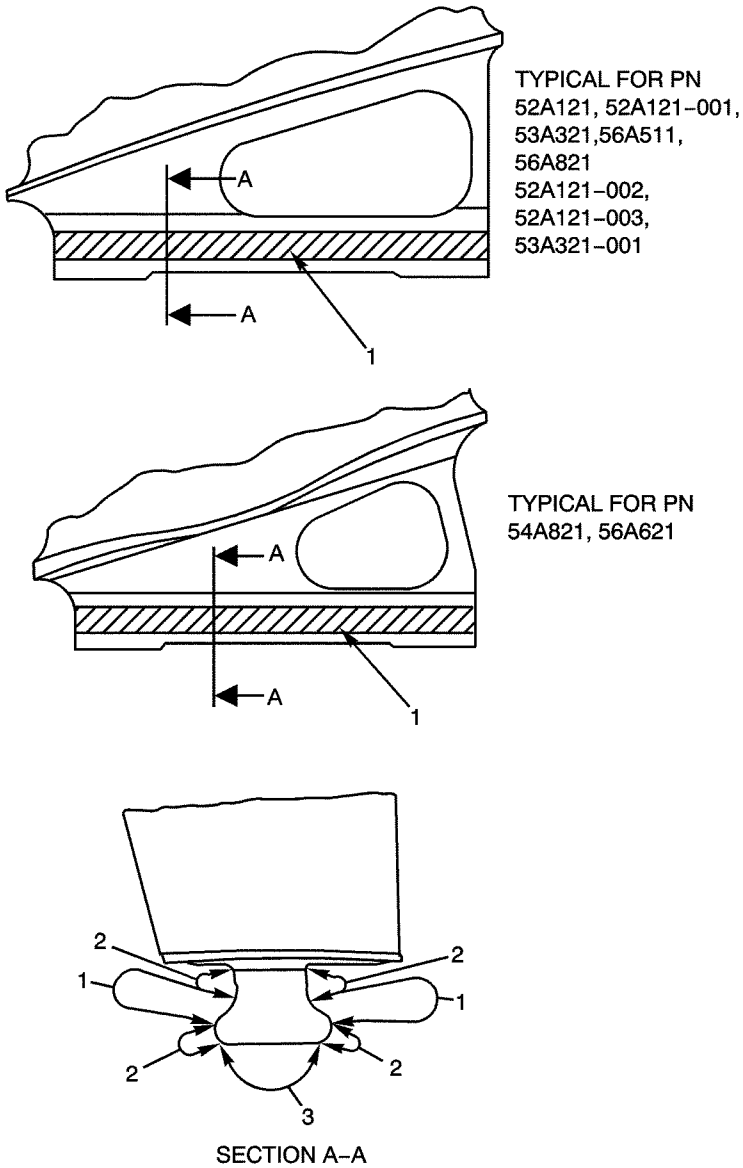
First Stage Compressor Rotor (Fan) Blades
Figure 403



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PW V

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1. BLADE ROOT APPLICATION AREA
2. A SMALL QUANTITY OF LUBRICATION IS ACCEPTABLE IN THIS AREA.
3. NO LUBRICATION APPLIED IN THIS AREA.

R Blade Root Dovetail Lubrication
Figure 404

FIRST STAGE COMPRESSOR (FAN) BLADE ASSEMBLY - INSPECTION/CHECK

1. Equipment and Materials

ITEM	DESIGNATION
A. PWA28403	Crack Standard, Eddy Current
B. PWA28404	Probe, Eddy Current
C. PWA28443	Probe
D. PWA75909	Probe
E.	Eddy Current Instrument Model ED1500 or Defectometer 2.154 or 2.164
F.	Signal Recorder (Optional) Models 135 XY, 7034A, 7044 or 680
G. Material No.P05-104	Special Materials (Ref. 70-00-00)
H. Material No.P05-010	Special Materials (Ref. 70-00-00)
R J. Material No.P05-125	Special Materials (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Standard Practices - Engine
- 72-21-02, P. Block 801	First Stage Compressor (Fan) Blade Assembly

2. Inspect First Stage Compressor Rotor (Fan) Blade (General Instructions)
(Ref. Fig. 601)

A. The general steps which follow are standard inspection data that are applicable during the inspection tasks.

(1) Blend limits are made to give blades the most satisfactory structural strength. The use of a large number of blades repaired to or near maximum limits, or the use of blades which have many repaired areas, can decrease compressor efficiency and thus decrease engine performance. (Ref. 72-21-02, P. Block 801) for limits on the quantity and size of repaired areas.

(2) All blade surfaces must be smooth. All signs of leading and trailing edge repairs must be smooth and rounded. (Ref. 72-21-02, P. Block 801) for minimum edge thickness limits.

(3) To know the depth of a blend at the leading or trailing edge, you must measure from the initial edge contour (the edge contour when the blade was manufactured).

NOTE : To find the initial edge contour, use a straight edge.

(a) You must add together all blends that are at the same position.

(b) If blend depth is at its maximum limit from the initial edge contour, no more blends are permitted.

(c) Do not measure from a raised material surface.

(4) Blends directly opposite each other on leading and trailing edges are also added together and must not be more than the maximum depth of a single leading or trailing edge blend.

(5) The minimum distance between blends that are to the maximum depth on leading and trailing edges must be equal to the mean chordal length of the blade. (Ref. 72-21-02, P. Block 801) for mean chordal limits.

(6) If it is necessary to do many blends or deep blends on adjacent blades, you must put these blades and their mating weighted blades in new positions symmetrically around the rotor to keep engine vibration to

a minimum.

(7)Blend procedures specified in this document are to make sure that all surface damage and below surface damage is removed. It is very important to obey blend procedures carefully when in the shop or on wing.

(8)After you blend a blade, it is necessary to examine the repaired areas with fluorescent penetrant or eddy current. Refer to Paragraph 8 and Paragraph 9.

(9)If there is damage on the fan blade adjacent to the core inlet, it is necessary to examine the engine for foreign object damage (called FOD). (Ref. 72-00-00, P. Block 601).

B. The table that follows shows the inspections that are in (Ref. 72-21-02, P. Block 601).

Paragraph	Area	Type of Damage	Detailed Visual Inspection, Part
3	Airfoil	Surface damage and cracks	I
4	Part span shroud	All	II
5	Airfoil	Bends and curl	III
6	Platform	All	IV
7	Root	All	V
8	Airfoil, Shroud (fluorescent penetrant used)	Cracks	
9	Leading and trailing edges (eddy current used)	Cracks	

Table 601

3. Inspect First Stage Compressor (Fan) Blade Airfoil for Surface Damage and Cracks (Detailed Visual Inspection, Part I)

A. Do this procedure when it is necessary for a detailed inspection during a regular engine inspection check, such as made necessary by the Maintenance Review Board, or when you think there is foreign object damage. (Ref. Fig. 602)

Inspect	MAXIMUM DEPTH OF DAMAGE		
	Serviceable Limit	Repairable Limit	Repairable Limit, (but with a 50 Hour Continue-In-Service Limit)
Area C The Tip	0.020 in. (0.508 mm)	0.750 in. (19.050 mm)	1.000 in. (25.400 mm)
Area D Shroud to Airfoil Radius	No damage permitted	No damage permitted	No damage permitted

Inspect	MAXIMUM DEPTH OF DAMAGE		
	Serviceable Limit	Repairable Limit	Repairable Limit, (but with a 50 Hour Continue-In-Service Limit)
Area E Leading and Trailing Edges	0.005 in. (0.127 mm)	0.250 in. (6.350 mm)	0.300 in. (7.629 mm)
Area F Platform to Airfoil Radius	No damage permitted	No damage permitted	No damage permitted
Leading and Trailing Edges	0.005 in. (0.127 mm)	0.150 in. (3.810 mm)	None
Area G Other Airfoil Surfaces	0.020 in. (0.508 mm)	0.030 in. (0.762 mm)	0.060 in. (1.524 mm)
Area H Leading Edge Surfaces	0.005 in. (0.127 mm)	0.250 in. (6.350 mm) See NOTE 1	0.300 in. (7.629 mm) See NOTE 1

R

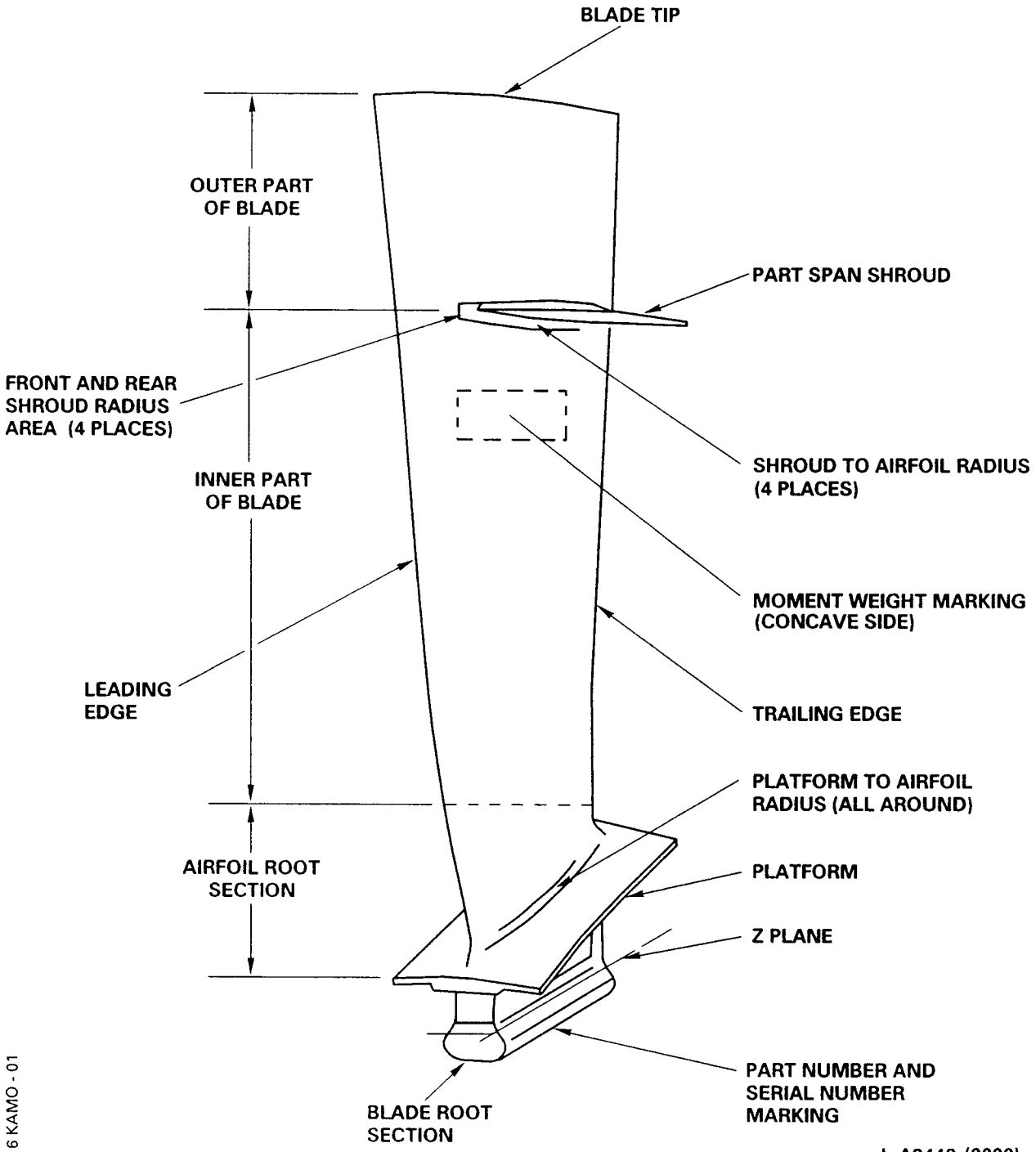
NOTE 1 : This limit may be found to be 0.500 in. (12.7 mm). Maximum in the CIR Manual. The higher limit is allowed for necessary bead peen and ECI at overhaul facility.

Airfoil Damage Limits
Table 602

WARNING : TO PREVENT POSSIBLE INJURY TO YOUR HANDS, USE GLOVES WHEN YOU TOUCH OR HOLD THE BLADES.

CAUTION : USE MAXIMUM CAUTION WITH ANY ELECTRICAL EQUIPMENT IN THE AREA OF THE BLADE. CONTACT WITH ANY ELECTRICAL SOURCE THAT CAN PASS CURRENT TO THE BLADE SURFACE CAN CAUSE AN ARC BURN. AN ARC BURN CAN CAUSE LOCAL DEGRADATION OF MATERIAL PROPERTIES AND BEGIN A CRACK.

(1)Use the inspection methods that follow to find damage.
  (a)Use a strong light and mirror.
  (b)Lightly rub the blade edge with gloves or cloth (which will catch on lifted material) to help find damage.
  (c)Use fingernails and fingertips to help in the identification of the size or condition of damage, for example to know if the damage has a V-shaped or rounded bottom.
(2)Examine the tip (Area C) of the blade.



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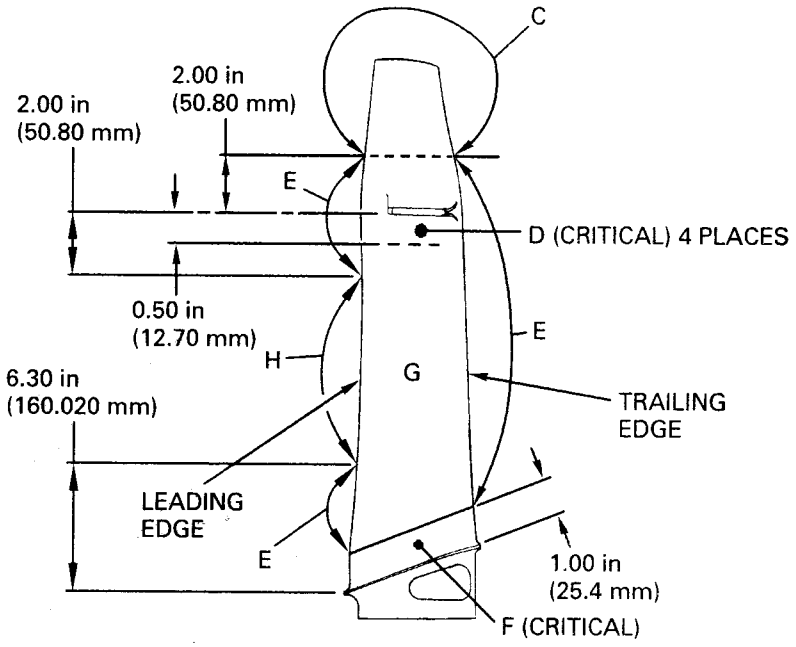
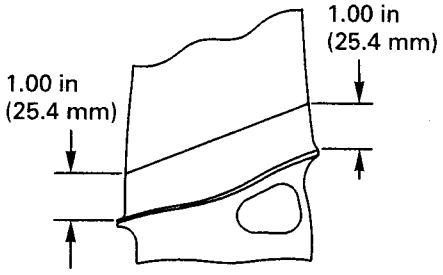
Names of Blade Areas
Figure 601

(a)Examine the tip for tears. Tears are not permitted.
(b)Examine the tip for nicks, dents, and other damage.
(c)Blade tip color change (for example, light blue color) is permitted.
CAUTION : NICKS IN LEADING AND TRAILING EDGES BECOME VERY IMPORTANT THE NEARER THEY ARE TO THE ROOT OF THE BLADE. VERY CAREFULLY EXAMINE ANY INJURY TO THE LEADING AND TRAILING EDGES THAT IS IN THE AREA BETWEEN THE PART SPAN SHROUD AND THE PLATFORM.
(3)Examine the leading and trailing edges and airfoil surfaces for nicks, dents, and other damage.
(a)The function of this inspection is to find damage that is local. This damage can be lifted edges or compressed material. This damage is different from erosion.
NOTE : Erosion is a uniform carrying away of material along the surface. It is identified by many, very small dents or depressions with the texture of sand paper.
It is permitted for blades with erosion to continue in service.
Erosion limits are given at shop overhaul.
Use your fingernail to help identify a local, sharp nick or dent from erosion.
(b)You must repair areas of lifted edges and compressed material which have small radii or rough edges. After repair, you must examine the area with fluorescent penetrant or eddy current. Refer to Paragraph 8 or Paragraph 9.
(c)Do not blend blades with damage that is more than the limits shown (Ref. Fig. 602). Keep them for possible repair, as specified by an approved repair source.
(4)Examine the airfoil for arc burn. Arc burn is not permitted.
NOTE : Arc burn is shown by a small circular or semi-circular heat damaged area on the blade surface that can have shallow pits, cracks, burns or melted areas.
(5)Examine the airfoil for cracks. Cracks are not permitted. Crack limits and crack removal procedures are in (Ref. 72-21-02, P. Block 801).

4. Inspect First Stage Compressor (Fan) Blade Part Span Shroud (Detailed Visual Inspection, Part II)
A. Do this procedure when it is necessary for a detailed inspection during a regular engine inspection check, such as made necessary by the maintenance review board, or when you think there is foreign object damage (Ref. Fig. 603).
WARNING : TO PREVENT POSSIBLE INJURY TO YOUR HANDS, USE GLOVES WHEN YOU TOUCH OR HOLD THE BLADES.
(1)Examine the blades to see if they are free to move at the shroud face at the engine top center. Loosen all stage 1 (LPC) fan blades as necessary.
(2)Examine the fan blades for part span shrouds (called shrouds) that are broken (fractured), cracked or not there.
(a)A fan blade with a shroud that is broken (fractured), cracked or not there is not permitted.
(b)If you find a shroud that has cracks, you must examine the shrouds of all the fan blades for cracks. Give special attention to the shroud radius (Area C) that is on the concave side of the airfoil, especially





ALTERNATE
CONFIGURATION

BM5 72 21 02 6 KCM0 02

L-A8821 (0896)

Airfoil Damage Limits
Figure 602

the side of Area C that is closest to the root of the blade.

(c)If a blade has a shroud that is cracked, you must remove the blade. You must also remove the blades that are on each side of the damaged blade.
You must also remove the fan blades that are the balanced pairs of these three blades. Therefore, for each blade that is damaged, you must remove six blades.

(3)If you find a shroud(s) that is broken (fractured) or not there do the steps that follows :

(a)Remove and replace the damaged blade and two adjacent blades along with their three moment weighed pairs. Report the serial numbers of the adjacent blades.

(b)Lubricate the shrouds and dispatch the aircraft.

(c)Obey a 25 hour flyback limit until you do a **NDI** inspection of all concave shrouds per **SB PW4ENG 72-478**.

(d)**NDI** reinspect all concave shrouds per **SB PW4ENG 72-478** within 40 cycles.

(e)Visually inspect at every 1/2 A-check (lubrication interval).
NOTE : This applies to the pre **SB PW4ENG 72-536** fan rotors only.
Inspect all post **SB PW4ENG 72-536** fan rotors at every A-check.

(f)**NDI** reinspect at next C-check.

(g)**NDI** reinspect at all overhauls.

(h)Notify **P&W** of any cracked fan blades found reporting :
- total time,
- total cycles,
- part number and change letter,
- part serial number and heat code,
- engine serial number,
- cycles since last inspection.
- part number and change letter,
- part serial number and heat code,
- engine serial number,
- cycles since last inspection.

(4)Examine Area A (shroud contact edge) for damage.

(a)No damage or blends are permitted.

(5)Examine Area B (shroud contact hardface surface) for cracks, wear or damage to the hardface.

(a)With the rotor stopped and not held, manually pull apart two blades closest to the 12 o'clock position.

(b)Inspect the part span shrouds for worn areas where the shrouds of the adjacent blades touch them. Hardface that is worn through is not permitted. Do not use the blade.
NOTE : This can cause peen damage and distortion of the titanium shroud.

(c)Erosion, mismatch or coverage that is not complete on the shroud hardface is permitted if it meets the conditions below (Ref. Fig. 605) :

1 Up to 0.060 in. (1.524 mm) maximum on one edge and on one side of the shroud only.

2 The surface must be well rounded with no sharp edges.

3 The depth must be no more than 0.020 in. (0.508 mm).

(d)Chips in the hardface edge larger than 0.060 in. (1.524 mm) are not permitted.
(e)If you think there is a crack, do a fluorescent penetrant inspection (Paragraph 8). Cracks are not permitted.
(6)Examine Area C (shroud radius) for damage (Ref. Fig. 607).
(a)No damage is permitted. You must repair all damage that is within limits.
1 It is not permitted for the repair to extend into the airfoil.
(b)Sharp edges are not permitted (Ref. 72-21-02, P. Block 801).
(c)If the damage is more than the blend limits, do not use the blade.
(7)Examine Area D (fillet radius) for damage (Ref. Fig. 603).
(a)Scattered damage with rounded bottoms that is less than 0.005 in. (0.127 mm) deep is serviceable.
(b)No other damage is permitted.
(8)Examine Area E (shroud upper and lower surfaces) for damage.
(a)No damage is permitted. You must repair all damage that is within limits. The maximum blend depth is 0.010 inch (0.254 mm).
(b)No broken, missing, or cracked shrouds are permitted.
(9)Examine Area F (shroud edges) for damage.
(a)No damage is permitted. You must repair all damage that is within limits. The maximum blend depth is 0.060 inch (1.524 mm).
(10)Turn the fan rotor to put the next two blades at the 12 o'clock location and do the same inspection procedure to examine all blades in the rotor.

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

4. Inspect First Stage Compressor (Fan) Blade Part Span Shroud (Detailed Visual Inspection, Part II)
A. Do this procedure when it is necessary for a detailed inspection during a regular engine inspection check, such as made necessary by the maintenance review board, or when you think there is foreign object damage (Ref. Fig. 604).
WARNING : TO PREVENT POSSIBLE INJURY TO YOUR HANDS, USE GLOVES WHEN YOU TOUCH OR HOLD THE BLADES.
(1)Examine the blades to see if they are free to move at the shroud face at the engine top center. Loosen all stage 1 (LPC) fan blades as necessary.
(2)Examine the fan blades for part span shrouds (called shrouds) that are broken (fractured), cracked or not there.
(a)A fan blade with a shroud that is broken (fractured), cracked or not there is not permitted.
(b)If you find a shroud that has cracks, you must examine the shrouds of all the fan blades for cracks. Give special attention to the shroud radius (Area C) that is on the concave side of the airfoil, especially the side of Area C that is closest to the root of the blade.
(c)If a blade has a shroud that is cracked, you must remove the blade. You must also remove the blades that are on each side of the damaged blade.

You must also remove the fan blades that are the balanced pairs of these three blades. Therefore, for each blade that is damaged, you must remove six blades.

(3)If you find a shroud(s) that is broken (fractured) or not there do the steps that follow :

(a)Remove and replace the damaged blade and two adjacent blades along with their three moment weighed pairs.
Report the serial numbers of the adjacent blades.

(b)Lubricate the shrouds and dispatch the aircraft.

(c)Obey a 25 hour flyback limit until you do a **NDI** inspection of all concave shrouds per **SB PW4ENG 72-478**.

(d)**NDI** reinspect all concave shrouds per **SB PW4ENG 72-478** within 40 cycles.

(e)Visually inspect at every A-check (lubrication interval).

(f)**NDI** reinspect at next C-check.

(g)**NDI** reinspect at all overhauls.

(h)Notify **P&W** of any cracked fan blades found reporting :
- total time,
- total cycles,
- part number and change letter,
- part serial number and heat code,
- engine serial number,
- cycles since last inspection.

(4)Examine Area A (shroud contact edge) for damage.

(a)No damage or blends are permitted.

(5)Examine Area B (shroud contact hardface surface) for cracks, wear or damage to the hardface.

(a)With the rotor stopped and not held, manually pull apart two blades closest to the 12 o'clock position.

(b)Inspect the part span shrouds for worn areas where the shrouds of the adjacent blades touch them. Hardface that is worn through is not permitted. Do not use the blade.

NOTE : This can cause peen damage and distortion of the titanium shroud.

(c)Erosion, mismatch or coverage that is not complete on the shroud hardface is permitted if it meets the conditions below (Ref. Fig. 605) :

1 Up to 0.060 in. (1.524 mm) maximum on one edge and on one side of the shroud only.

2 The surface must be well rounded with no sharp edges.

3 The depth must be no more than 0.020 in. (0.508 mm).

(d)Chips in the hardface edge larger than 0.060 in. (1.524 mm) are not permitted.

(e)If you think there is a crack, do a fluorescent penetrant inspection (Paragraph 8). Cracks are not permitted.

(6)Examine Area C (shroud radius) for damage (Ref. Fig. 607).

(a)No damage is permitted. You must repair all damage that is within limits.

1 It is not permitted for the repair to extend into the airfoil.

(b)Sharp edges are not permitted (Ref. 72-21-02, P. Block 801).

(c)If the damage is more than the blend limits, do not use the blade.

(7)Examine Area D (fillet radius) for damage (Ref. Fig. 604).
(a)Scattered damage with rounded bottoms that is less than 0.005 in. (0.127 mm) deep is serviceable.
(b)No other damage is permitted.
(8)Examine Area E (shroud upper and lower surfaces) for damage.
(a)No damage is permitted. You must repair all damage that is within limits. The maximum blend depth is 0.010 inch (0.254 mm).
(b)No broken, missing, or cracked shrouds are permitted.
(9)Examine Area F (shroud edges) for damage.
(a)No damage is permitted. You must repair all damage that is within limits. The maximum blend depth is 0.060 inch (1.524 mm).
(10)Turn the fan rotor to put the next two blades at the 12 o'clock location and do the same inspection procedure to examine all blades in the rotor.

**ON A/C 101-200,

5. Inspect First Stage Compressor (Fan) Blade Airfoil for Bends and Curl (Detailed Visual Inspection, Part III)
A. Do this procedure when you think there is foreign object damage. (Ref. Fig. 606)

R

WARNING : TO PREVENT POSSIBLE INJURY TO YOUR HANDS, USE GLOVES WHEN YOU TOUCH OR HOLD THE BLADES.

(1)Examine the tip of the blade for bends and curl.
NOTE : A curl is a small bend.
(a)Tip curl is permitted without repair if dimension P is equal to or less than 0.200 inch (5.080 mm) and there are no more than five blades (three adjacent) with this condition. Tip curl with cracks or tears is not permitted.
(b)A blade with the conditions that follow can continue in service without repair for 50 hours.
1 A Dimension P maximum of 2.000 inches (50.800 mm)
2 A Dimension R maximum of 0.500 inch (12.700 mm).
3 No tear, no crack.
(2)Examine the leading and trailing edges for bends.
(3)If the bends are beyond the limits, keep the blade for possible repair.

6. Inspect First Stage Compressor (Fan) Blade Platform (Detailed Visual Inspection, Part IV)
A. Do this procedure when you think there is foreign object damage. (Ref. Fig. 608)

	MAXIMUM DEPTH OF DAMAGE	
Inspect	Serviceable Limit	Repairable Limit
1 Reference Dimension	0.300 Inch (7.620 mm) minimum	
A Platform Surface	0.005 inch (0.127 mm)	0.020 inch (0.508 mm)

	MAXIMUM DEPTH OF DAMAGE	
Inspect	Serviceable Limit	Repairable Limit
1	0.300 Inch	
B Root Face	0.005 inch (0.127 mm)	0.040 inch (1.016 mm)

Platform Inspection Limits
Table 604

WARNING : TO PREVENT POSSIBLE INJURY TO YOUR HANDS, USE GLOVES WHEN YOU TOUCH OR HOLD THE BLADES.

(1)Visually examine the platform surfaces for nicks, dents and scratches.
  (a)Use 10X magnification.
  (b)Repair blades that have damage (Ref. 72-21-02, P. Block 801).
(2)Examine the platform for cracks.
  (a)Cracks are not permitted. There is no repair for cracks. Do not use these blades.

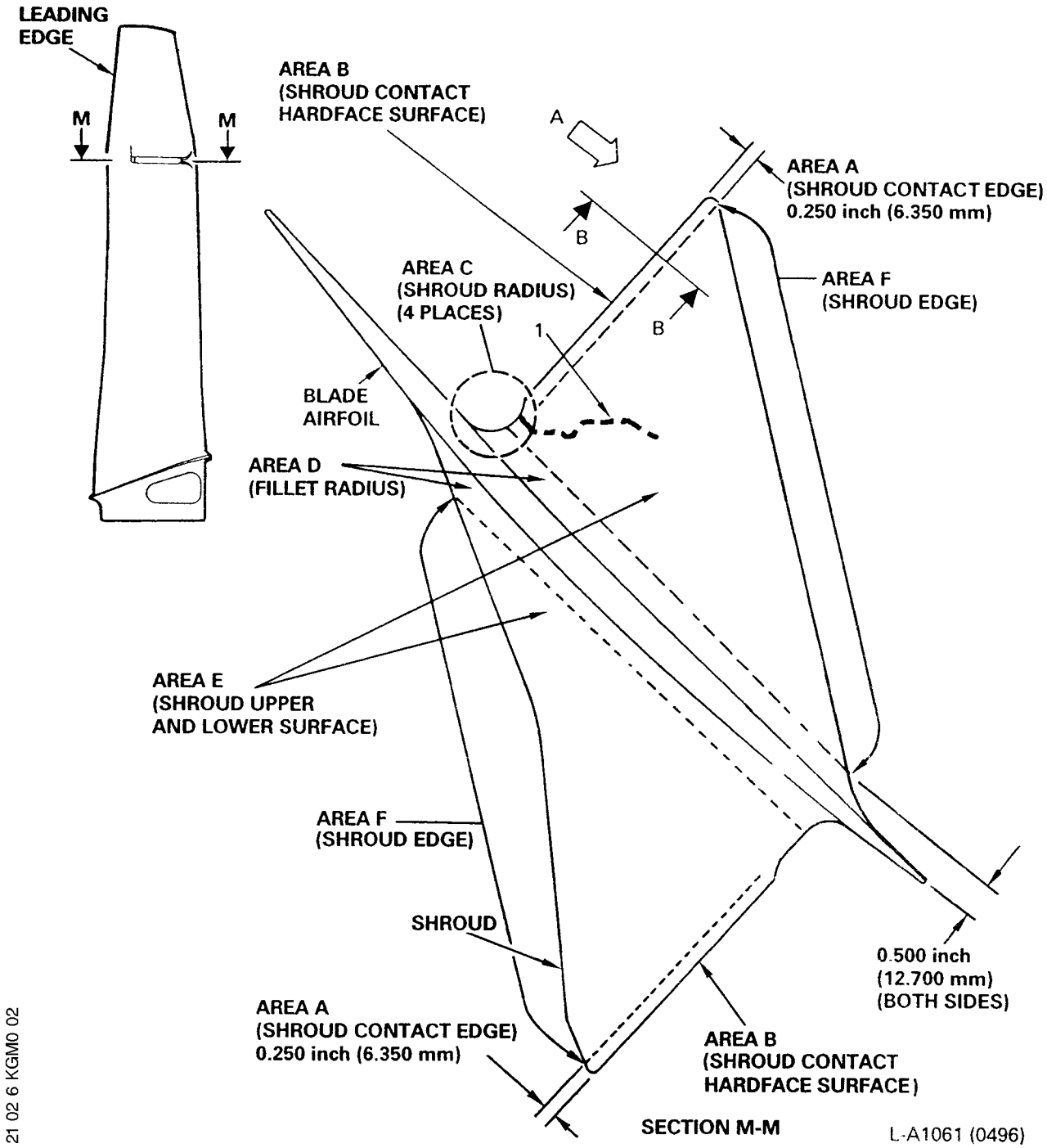
7. Inspect First Stage Compressor (Fan) Blade Root (Detailed Visual Inspection, Part V)

A. Do this procedure if you can see the blade root. (Ref. Fig. 609)

	MAXIMUM DEPTH OF DAMAGE	
Inspect	Serviceable Limits	Repairable Limits
1 Reference Dimension	0.200 inch (5.080 mm) minimum	
A Root Edge	0.005 inch (0.127 mm)	0.040 inch (1.016 mm)
B Platform Surface	0.005 inch (0.127 mm)	0.020 inch (0.508 mm)
C Under the Platform Radius	0.000 inch (0.000 mm)	0.005 inch (1.127 mm)

Blade Root Inspection Limits
Table 605

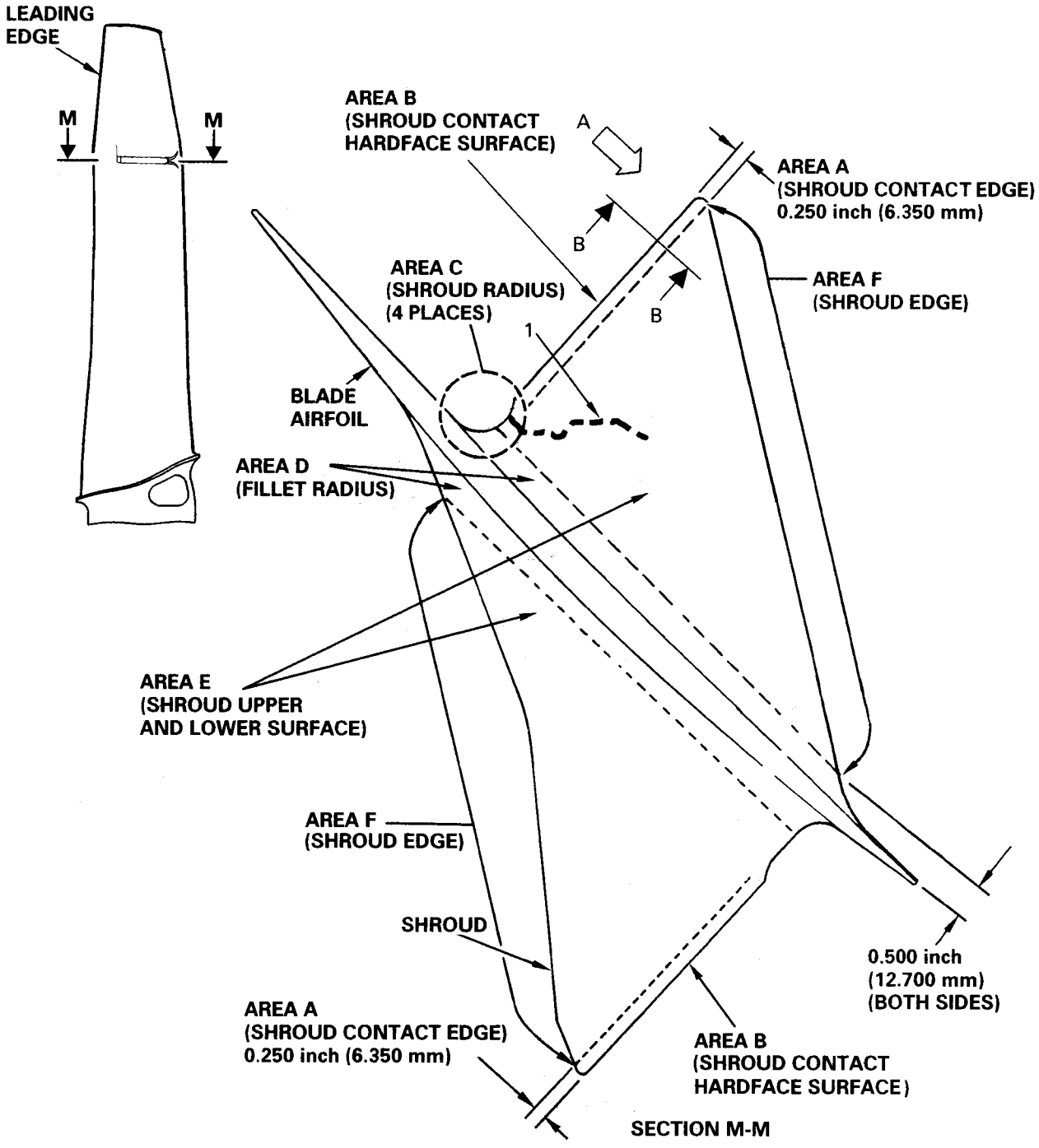
WARNING : TO PREVENT POSSIBLE INJURY TO YOUR HANDS, USE GLOVES WHEN YOU TOUCH OR HOLD THE BLADES.



BM5 72 21 02 6 KGM0 02

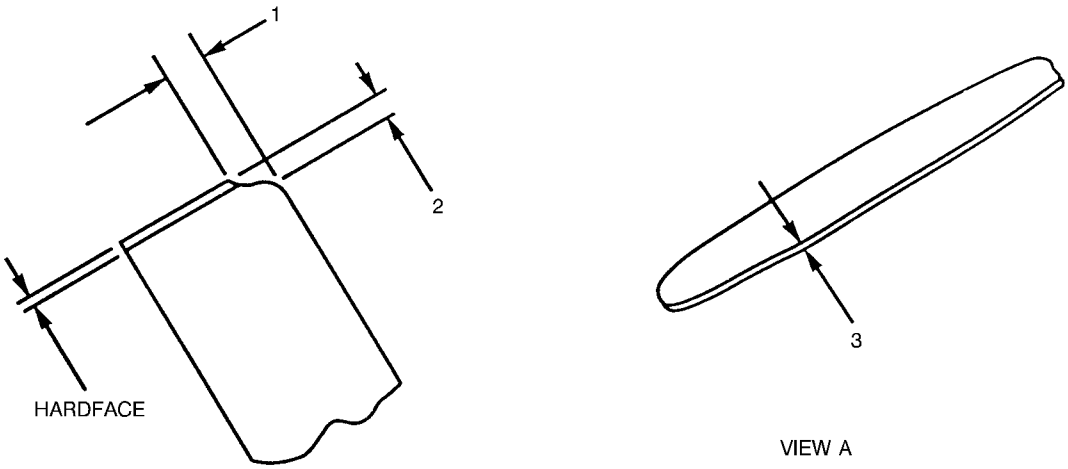
1. EXAMINE THE SHROUD RADIUS FOR CRACKS

Areas of the Part Span Shroud
(PN 53A321 Typical)
Figure 603



1. EXAMINE THE SHROUD RADIUS FOR CRACKS.

Areas of the Part Span Shroud
(PN 54A821 Typical)
Figure 604



L-B2611 (0000)
PW V

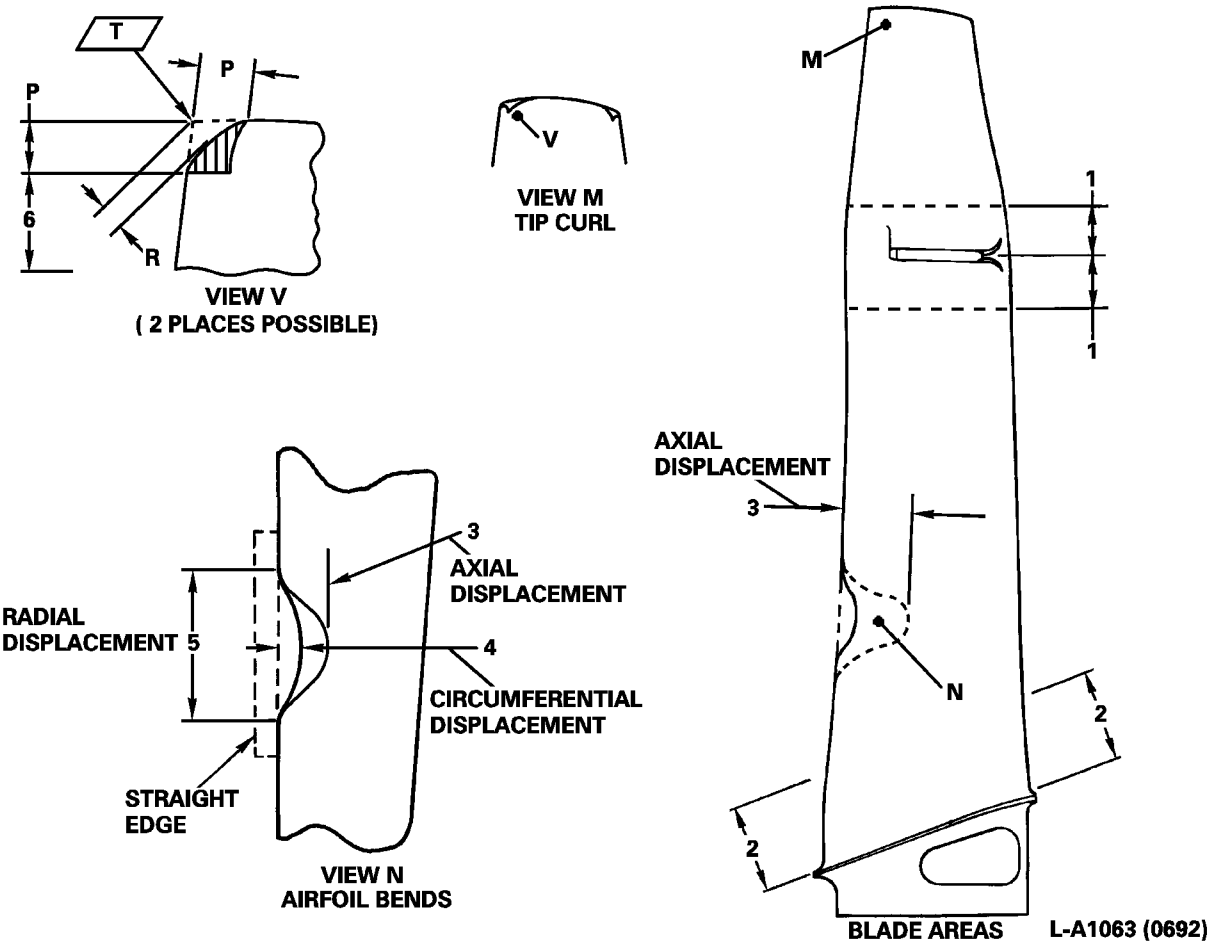
1. UP TO 0.060in. (1.524mm) ON ONE EDGE
2. 0.020in. (0.508mm) MAXIMUM
3. 0.060in. (1.524mm) MAXIMUM ON ONE EDGE

BM5 72 21 02 6 KRM0 00

Areas of the Part Span Shroud

15/12/09P4 AS

Figure 605

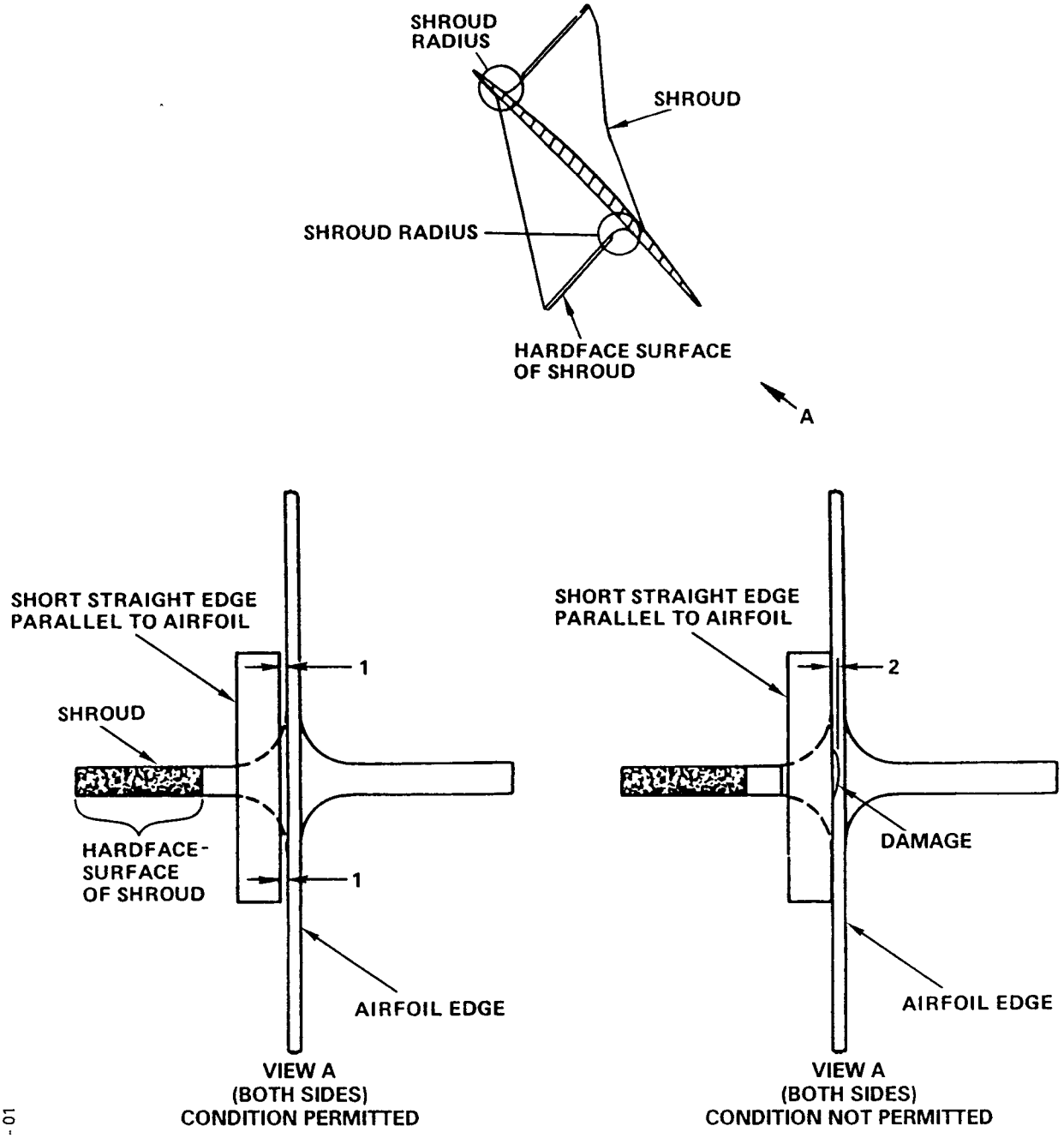


1. 1.000 IN. (25.400 MM). BENDS ARE NOT PERMITTED IN THIS AREA.
2. 6.300 IN. (160.020 MM). BENDS ARE NOT PERMITTED IN THIS AREA.
3. 0.750 IN. (19.05 MM) MINIMUM TO 2.500 IN. (63.500 MM) MAXIMUM WHEN THE CIRCUMFERENTIAL DISPLACEMENT IS 0.125 IN. (3.175 MM). WHEN THE CIRCUMFERENTIAL DISPLACEMENT IS LESS THAN 0.125 IN. (3.175 MM), THE AXIAL DISPLACEMENT MUST BE AT LEAST SIX TIMES THE CIRCUMFERENTIAL DISPLACEMENT.
4. 0.125 IN. (3.175 MM) MAXIMUM
5. 1.500 IN. (38.100 MM) MAXIMUM. THIS DIMENSION MUST BE AT LEAST 12 TIMES, BUT NOT MORE THAN 40 TIMES, THE CIRCUMFERENTIAL DISPLACEMENT.
6. 1.300 IN. (33.020 MM). BENDS ARE NOT PERMITTED IN THIS AREA.

NOTE : T IS THE ORIGINAL POSITION OF THE CORNER.

BM5 722102 6 KEM0 05

Airfoil Bend Limits
Figure 606

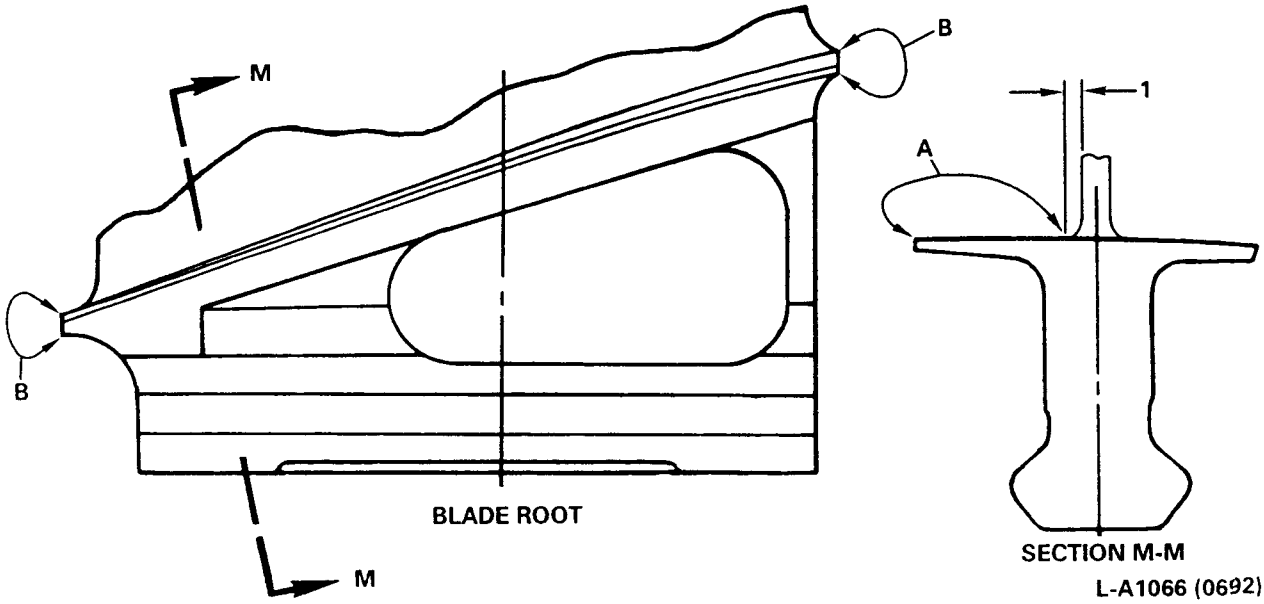


BM5 72 21 02 6 KJMO - 01

1. 0.000 IN. (0.000 MM) MINIMUM CLEARANCE BETWEEN THE BLEND AND THE AIRFOIL.
2. THE BLEND MUST NOT BE IN THE AIRFOIL.

L-A8444 (0000)

Area C (Shroud Radius) Inspection Limits
Figure 607



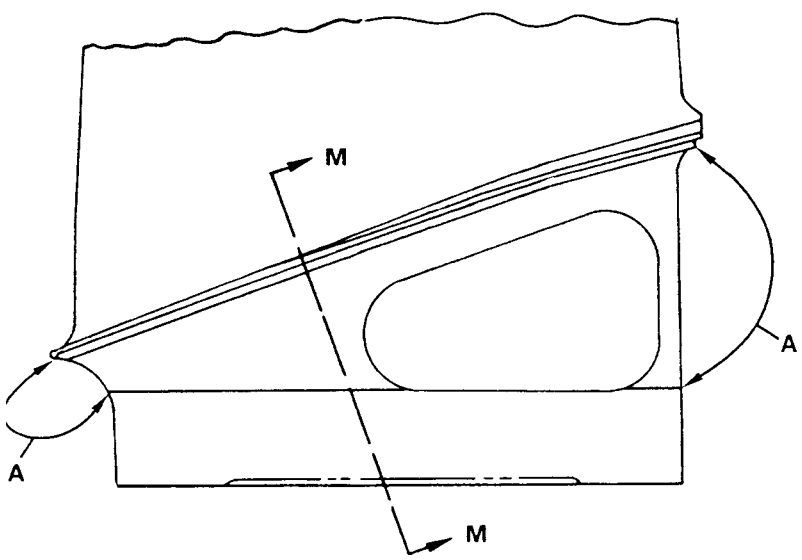
BM5 72 21 02 6 KLMO - 01

Platform Inspection Limits
Figure 608

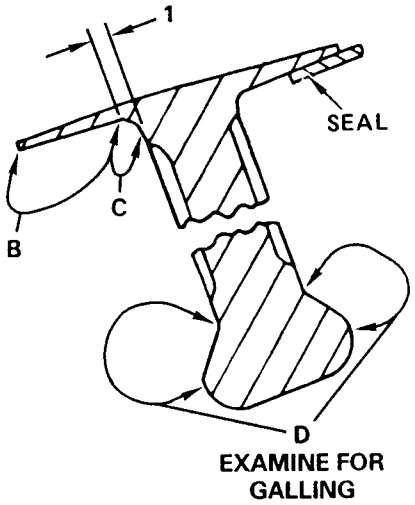
(1)Examine the platform for damaged or loose rubber seals or rubber seals which are not there. To replace a seal (Ref. 72-21-02, P. Block 801).
NOTE : Partially unbonded or raised seals must be trimmed so as not to protrude into the airstream. A trimmed seal counts as a missing seal.
(a)A maximum of 19 seals in any location can be missing until the next C Check.
(b)At the next C Check, you must replace all of the missing seals, or you must install fan blade pairs with properly bonded seals to replace all fan blades with missing seals.
(c)Optional, it is permitted to continue service operation without restriction with a maximum of six (6) missing seals in any location.
(2)Examine areas A, B, and C for wear, nicks, dents, and other damage. Refer to the figure for limits.
(a)Repair blades that have damage that is more than the limits.
(3)Examine area D for galling. If there is much galling, you must use the visual inspection that is in the engine manual to examine the blade.
(4)Examine all areas for cracks.
(a)Cracks are not permitted. There is no repair for cracks. Do not use these blades.

8. Use Fluorescent Penetrant to Inspect the First Stage Compressor (Fan) Blade Airfoil and Shroud for Cracks
A. Do this inspection (or eddy current inspection) if you think there are cracks and as a postrequisite to Repair-01.
(Ref. Fig. 610)
WARNING : TO PREVENT POSSIBLE INJURY TO YOUR HANDS, USE GLOVES WHEN YOU TOUCH OR HOLD THE BLADES.
(1)Examine the areas of the blade where you think there are cracks. Use SPOP 70 with ultra high sensitivity penetrant (Ref. 70-00-00, P. Block 201).
(2)Cracks are not permitted.

9. Use Eddy Current to Examine the First Stage Compressor (Fan) Blade Leading and Trailing Edges
A. Do this inspection (or fluorescent penetrant inspection) if you think there are cracks and as a postrequisite to Repair-01.
WARNING : TO PREVENT POSSIBLE INJURY TO YOUR HANDS, USE GLOVES WHEN YOU TOUCH OR HOLD THE BLADES.
(1)Prepare the blade for inspection as follows :
(a)Clean the edges of the blade with a SPOP 208 solvent (Ref. 70-00-00, P. Block 201).
(b)Use Material No.P05-104 to remove small surface defects before inspection.
(2)Calibrate and set up equipment as follows :
NOTE : Calibrate the instrumentation before and after each set of blades is inspected and if the instrumentation has been turned off. Change the Material No.P05-125 on the probe tip at regular times to prevent wear to the probe tip.



BLADE ROOT

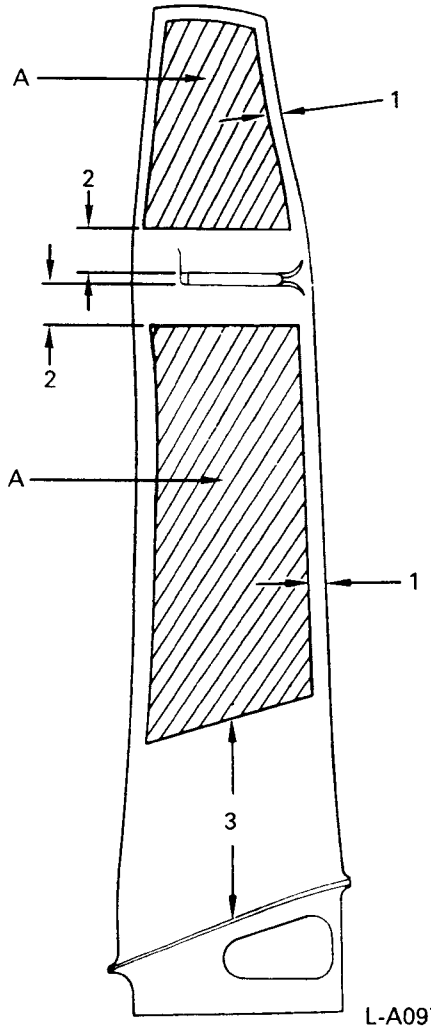


SECTION M-M

L-A1326 (0692)

BM5 72 21 02 6 KNMU - 01

Blade Root Inspection Limits
Figure 609



L-A0970 (0692)

1. 0.500 IN. (12.700 MM) ALL AROUND
2. 0.500 IN. (12.700 MM)
3. 6.300 IN. (160.020 MM)

NOTE : INSPECTION IS NOT NECESSARY FOR AREAS IDENTIFIED AS "A".

Fluorescent Penetrant Inspection Areas
Figure 610

Probe PN	Is Used To Examine These Blade Areas	On A Blade That Is
PWA 28404	Leading and Trailing Edges	Not Installed
PWA 28404	Leading Edge Only	Installed
PWA 28443	Trailing Edge Only	Either Installed or Not Installed
PWA 75909	Leading and Trailing Edges	Either Installed or Not Not Installed

NOTE : You can use PWA 75909 Probe instead of PWA 28404 and PWA 28443 Probes.

The Eddy Current Probes
Table 606

(a)Connect probe PWA 75909 or PWA 28404 or PWA 28443 to the eddy current instrument. If a recorder is used, connect the recorder to the eddy current instrument. Turn on the instrument and, if applicable, the recorder to permit them to warm up. Obey the manufacturer's instructions.

(b)Cover the probe tip bearing surface with Material No.P05-125 to permit the probe to move easily and stay in position and prevent probe wear.

(c)Set the instrument to Fe (iron) operation.

(d)Adjust the lift-off compensation with the probe on the PWA 28403 Crack Standard edge radius in the area away from the crack standard slot. Scan the crack standard (go across the slot at a slow, constant velocity). Adjust the sensitivity to get a five unit meter deflection when the probe is passed over the standard slot, or optionally set the recorder sensitivity to get the eddy current trace to show a 2.5 inch (63.500 mm) "spike" when it moves across the standard slot.

NOTE : Slow velocity or "track speed" is approximately 0.5 inch (12.700 mm) per second. A "spike" is any fast meter movement over baseline meter indications.

(e)If the recorder is used, adjust the chart speed to show a four to six inch (101.600 - 152.400 mm) trace with a moderate track speed of the probe along the blade edge.

(3)Examine the blade edges as follows :

NOTE : As the probe gets closer to the platform, the blade edge can become too thick to fit into the probe tip. It is then permitted to gradually lift the probe off the blade edge if a normal eddy current lift-off signal occurs.

(a)Scan the leading or trailing edges from the blade tip to the platform with the probe.

NOTE : Scanning speed must be slow so that the defect indications are easily identified from the usual baseline meter indications.

CAUTION : IF THE TRAILING EDGE PROBE IS NOT USED CORRECTLY, IT IS POSSIBLE THAT AREAS OF THE BLADE WILL NOT GET FULL INSPECTION.

(b)Put the probe in position from the convex side of the airfoil with the

eddy current coil in the lower ear of the probe. Scan the trailing edge. Start at the blade tip and move to the platform.

NOTE : Correct installation of the probe is necessary to examine as near as possible to the blade root platform. If a probe is manufactured by a vendor, put the probe on the concave or convex side of the airfoil so the ear of the probe is in the direction of the blade root platform.

(c) Any spikes are cause for more inspection. Scan the blade sections again to make sure that the spikes are not caused by the operator.

(d) Examine for edge damage with your fingers.

(e) Small foreign object damage (which is possible to blend) can give a signal as large as a one unit upscale deflection followed by downscale deflection. Repair the damage (Ref. 72-21-02, P. Block 801). Examine the area after the repair.

(f) An upscale signal and return which is larger than one meter unit (no indication is permitted on the recorder trace) in areas where damage was removed are an indication of cracks. Repair the damage (Ref. 72-21-02, P. Block 801). If the depth of the crack is more than the limits, keep the blade for a possible repair at a subsequent date.

STAGE 1 FAN BLADE - APPROVED REPAIRS

1. Blend Repair Blade Airfoil

A. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedures - 70-00-00, P. Block 201	Engine - Standard Practices

B. General (Ref. Fig. 801, 802)

(1)Following instructions are standard repair criteria which apply to fan blade repair procedures.

WARNING : TO AVOID POSSIBILITY OF INJURY TO HANDS, GLOVES SHOULD BE WORN WHEN HANDLING BLADES.

CAUTION : NICKS IN LEADING AND TRAILING EDGES BECOME INCREASINGLY CRITICAL THE CLOSER THEY ARE TO ROOT OF BLADE. THEREFORE, EXTREME CARE MUST BE EXERCISED WHEN REPAIRING DAMAGE IN INNER HALF OF AIRFOIL.
EXCESSIVE HEAT CREATED DURING BLENDING CAN WEAKEN BLADE SUFFICIENTLY TO CAUSE FRACTURE. TO AVOID EXCESSIVE HEAT, DO NOT USE POWER GRINDING TOOL. POWER CUTTING TOOLS MAY BE USED IF BLADE IS PERIODICALLY CHECKED FOR HEAT BUILD-UP BY TOUCHING OCCASIONALLY WITH UNGLOVED HAND. IF BLADE BECOMES TOO HOT TO TOUCH, ALLOW MATERIAL TO COOL BEFORE CONTINUING REPAIR.

NOTE : Dull tools and worn or loaded abrasive cloth generate heat rapidly and should be checked frequently and replaced when necessary. For definitions of specific areas of blade referred to in following procedure (Ref. 72-21-02, P. Block 601).

(a)All blend repairs on blade surface must be smooth and all blend repairs to leading and trailing edges must be smooth and well rounded maintaining minimum edge thickness as shown in (Ref. Fig. 801)

(b)All blend limits are based on original edge contour. Therefore, all blends in one location are cumulative.

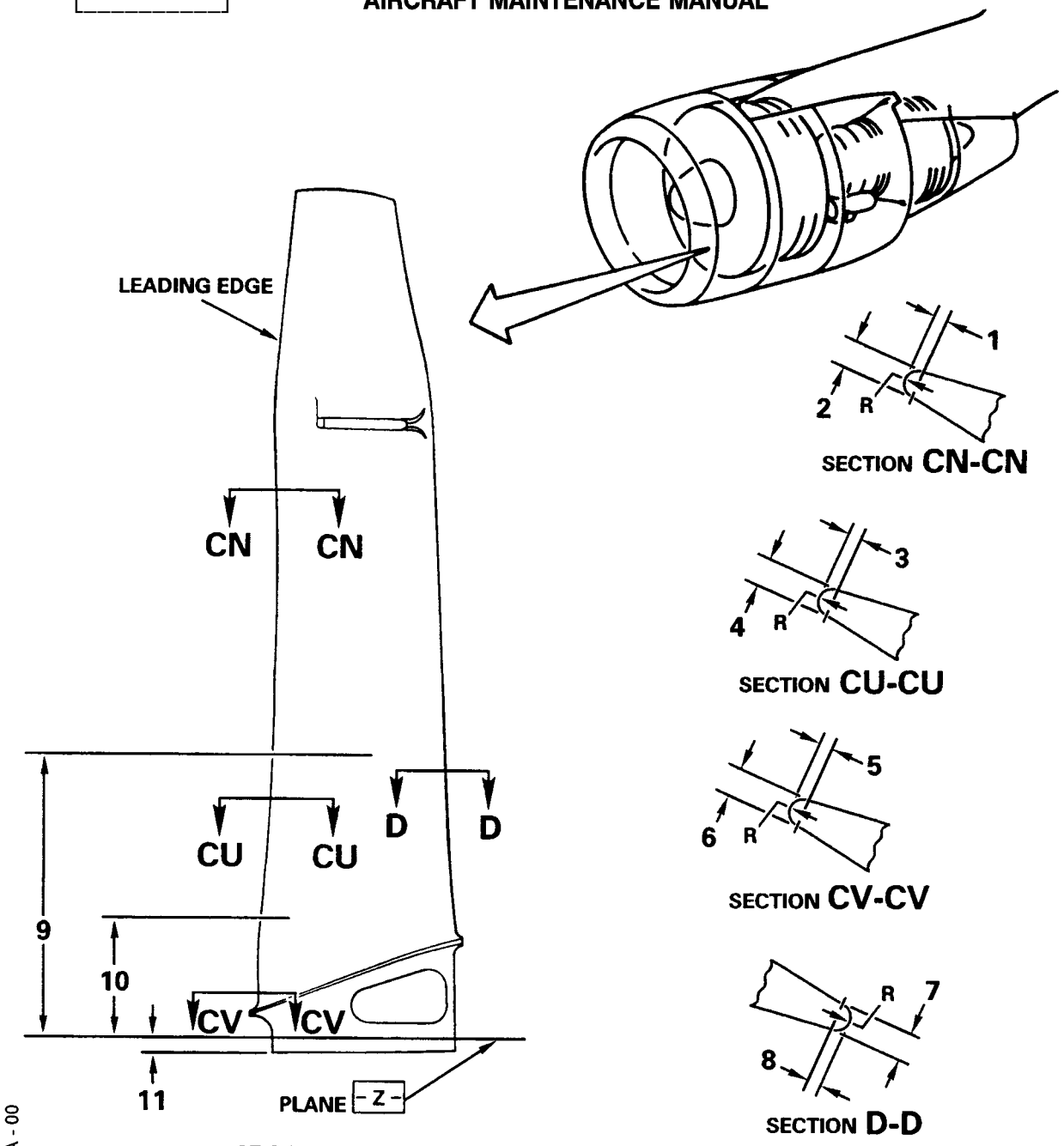
NOTE : For example if blend depth limit is 0.500 in. (12.700 mm) and 0.200 in. (5.080 mm) blend is made, no future blend nor the sum of any future blends may exceed 0.300 in. (7.620 mm) at that location.

(c)Blends directly opposite one another on leading and trailing edges are also cumulative and must not exceed depth of single leading and trailing edge repairs.

(d)Maximum depth blends on leading and trailing edges must be separated by minimum distance equal to mean chordal length of blade. (Ref. Fig. 802)

(e)Depth of blends may be estimated by measuring distance between straight edge laid along leading or trailing edge and deepest point of blend.

(f)All edges, of repaired area must be finished to form well rounded radii with smooth surface.



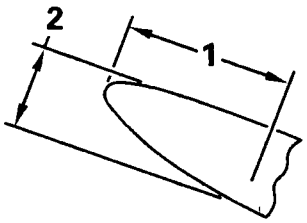
1ST STAGE FAN BLADE

1. 0.013 Inch (0.330 mm)
2. 0.022 Inch (0.559 mm)
3. 0.018 Inch (0.457 mm)
4. 0.033 Inch (0.838 mm)
5. 0.0165 Inch (0.419 mm)
6. 0.033 Inch (0.838 mm)
7. 0.020 Inch (0.508 mm) For The Full Length Of The Blade
8. 0.040 Inch (1.016 mm)
9. 9.795 - 10.045 Inch (248.8 - 255.1 mm)
10. 4.100 - 4.350 Inch (104.1 - 110.5 mm)
11. 0.560 Inch (14.224 mm)

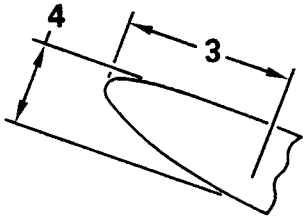
BM5 72 21 02 8 KAMA - 00

L-A8006 (0000)

Leading and Trailing Edge Minimum Thickness Limits (PN 52A121, 52A121-001, 52A121-002 and 52A121-003) (Sheet 1/3)
Figure 801



SECTION CN-CN



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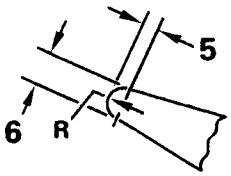
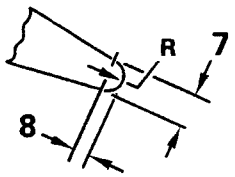
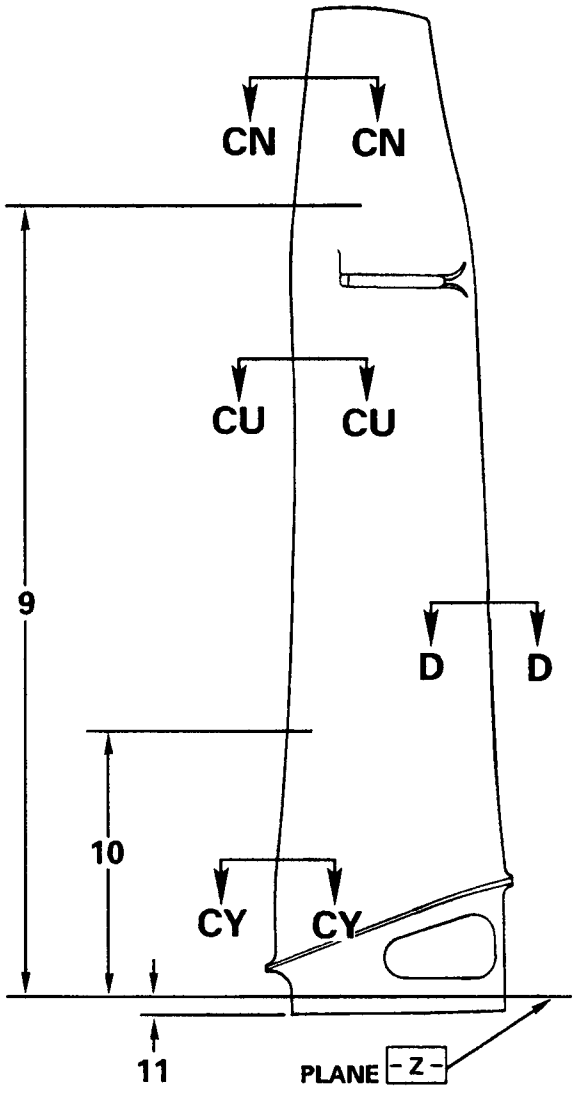


SECTION CY-CY



SECTION D-D



1ST STAGE FAN BLADE

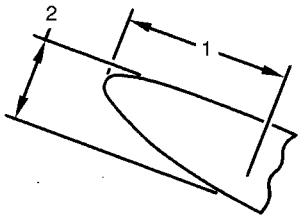
1. 0.032 Inch (0.813 mm)
2. 0.025 Inch (0.635 mm)
3. 0.086 Inch (2.184 mm)
4. 0.041 Inch (1.041 mm)
5. 0.040 Inch (1.016 mm)
6. 0.031 Inch (0.787 mm)
7. 0.020 Inch (0.508 mm) For The Full Length Of The Blade
8. 0.040 Inch (1.016 mm)
9. 23.465 - 23.715 Inch (596.0 - 602.4 mm)
10. 7.812 - 8.062 Inch (198.4 - 204.8 mm)
11. 0.56 Inch (14.224 mm)

L-A8007 (0000)

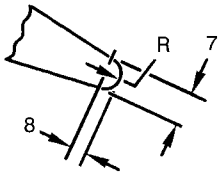
BM5 72 21 02 8 KAMC - 00

Leading and Trailing Edge Minimum Thickness Limits
(PN 53A321, 56A511, 56A821 and 53A321-001) (Sheet 2/3)
Figure 801

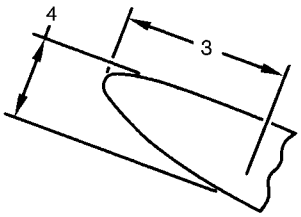
SECTION
CN-CN



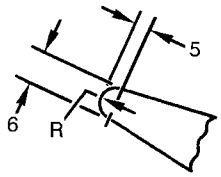
SECTION
D-D

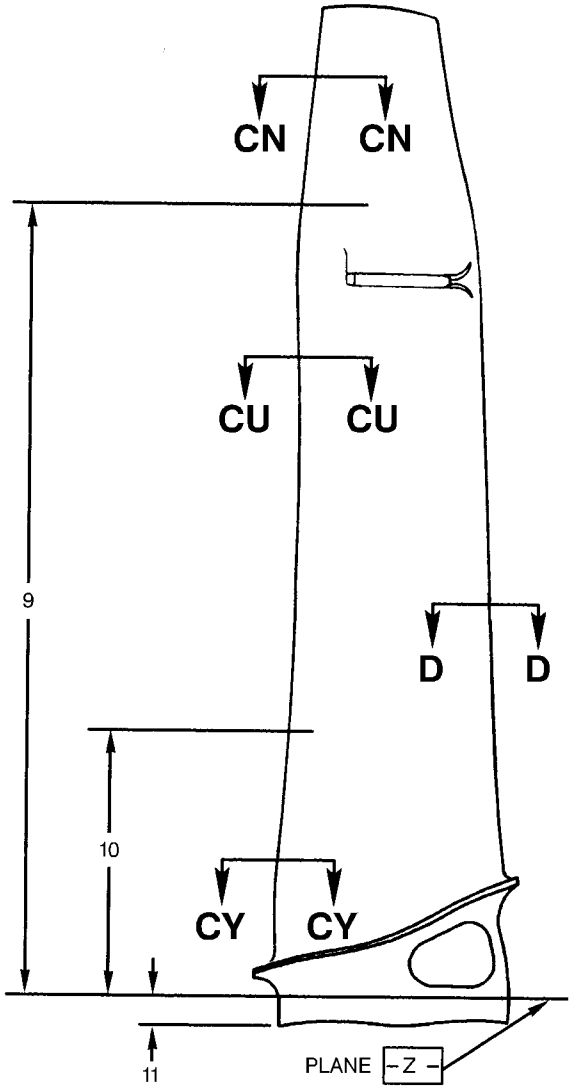


SECTION
CU-CU



SECTION
CY-CY





1ST STAGE FAN BLADE

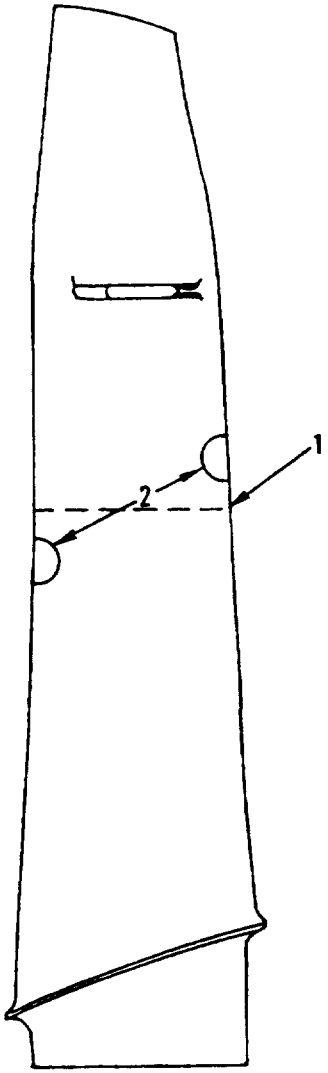
L-B2771(0000)

1. 0.032in.(0.813mm)
2. 0.025in.(0.635mm)
3. 0.086in.(2.184mm)
4. 0.041in.(1.041mm)
5. 0.040in.(1.016mm)
6. 0.031in.(0.787mm)
7. 0.030in.(0.762mm) FOR THE FULL LENGHT OF THE BLADE
8. 0.040in.(1.016mm)
9. 22.609-22.859in.(574.3-580.6mm)
10. 7.812-8.062in.(198.4-204.8mm)
11. 0.56in.(14.224mm)

BM5 72 21 02 8 KAME 00

Leading and Trailing Edge Minimum Thickness Limits
(PN 54A821 and 56A621) (Sheet 3/3)
Figure 801

1. MEAN CHORDAL LENGTH MEASURED EQUIDISTANT BETWEEN BLENDS
2. BLENDS MUST BE SEPARATED BY MINIMUM DIMENSION EQUAL TO INDEX 1 DIMENSION



L-A2318

BM5 72 21 02 8 KCM0 00

Minimum Blend Separation
Figure 802

C. Procedure
(Ref. Fig. 803, 804, 805)
(Ref. Fig. 806)
(1)Radial length-to-depth ratio of blends to airfoil must be within limits shown in (Ref. Fig. 803).
(2)The following procedure is used to blend repair cracks and damage exceeding 0.005 in. (0.127 mm) in depth in edge area, indexes E, F and H, or exceeding 0.020 in. (0.508 mm) in depth in leading and trailing edges in area index C as shown in (Ref. Fig. 804).
Step (3) provides an optional blending procedure using fluorescent penetrant as inspection criteria.
(a)Blend blade to base of damage.
NOTE : For blend repairs done at line stations that do not have FPI/EDDY CURRENT inspection capability, the following FLYBACK limit applies :
1 Blend out leading edge tear or crack.
2 Blend an additional 0.020 in. (0.50 mm).
3 The FPI/EDDY CURRENT inspection must be done at a line station or maintenance base capable of performing the inspection, not to exceed six flight cycles.
(b)Eddy current inspect area (Ref. 72-21-02, P. Block 601).
(c)If no crack is found, blend additional 0.020 in (0.508 mm) beyond damage depth.
(d)If eddy current inspection reveals presence of crack, blend to minimum of 0.020 in. (0.508 mm) beyond crack. Reinspect area using eddy current inspection (Ref. 72-21-02, P. Block 601).
Repeat blending until no crack is found, then blend additional 0.020 in. (0.508 mm) in depth. See (Ref. Fig. 804) for maximum blend depth limits.
(e)Blades exceeding maximum blend depth limits may not be returned to service and should be held for possible future repair.
(3)The following procedure is used to blend repair cracks and damage exceeding 0.005 in. (0.127 mm) in depth in edge area, indexes E, F and H, or exceeding 0.020 in. (0.508 mm) in depth in leading and trailing edges as shown in (Ref. Fig. 804). This procedure is given as an optional repair procedure to procedure in previous step which uses eddy current as inspection criteria.
(a)Inspect edges of blades per SPOP 70. Use ultra high sensitivity penetrant (Ref. 70-00-00, P. Block 201).
(b)If no crack is indicated in damaged area, blend out 0.060 in (1.524 mm) in depth beyond damage.
(c)If inspection reveals presence of crack, mark out area to be blended. Blend out area to minimum of 0.060 in. (1.524 mm) in depth beyond crack.
Fluorescent penetrant inspect per preceding step. Repeat blending and inspection as required until no crack is indicated.
(d)Immediately after repair or before 120 hours of operation, eddy current inspect the repair areas, (Ref. 72-21-02, P. Block 601).
1 If no crack is found, blend any new damage as required and reinspect using eddy current inspection (Ref. 72-21-02, P. Block 601).
2 If crack is found, blend minimum of 0.020 in. (0.508 mm) beyond

crack. Repeat eddy current inspection (Ref. 72-21-02, P. Block 601) and blend as required until no crack is indicated. Blend additional 0.020 in. (0.508 mm) in depth.

(e)If maximum blend depth is exceeded, blade should not be returned to service and should be held for possible future repair.

(4)Blend to remove damage such as sustained indentations (having material compressed and edges raised) and injuries with small radii and ragged edges.

NOTE : Remove only edges of damaged area when repairing relatively smooth and round bottomed indentations.

(5)Blend leading and trailing edge root areas as shown in (Ref. Fig. 805).

(6)If after blending repairs are completed, two (2) or more heavily blended blades are grouped together, blended blades and their matching blades should be redistribued evenly throughout rotor.

NOTE : Unless redistribution can be successfully accomplished a vibration check is recommended.

(7)Whenever power tools are used in blending, last 0.060 in. (1.524 mm) in depth must be blended using hand tools.

(8)Polish blended areas per SPOP 532 (Ref. 70-00-00, P. Block 201).

(9)Record depth of blending on blade platform as shown in (Ref. Fig. 806) using vibration peen method (Ref. 70-00-00, P. Block 201).

(a)Precede marked dimension with code letter L for leading edge or T for trailing edge blend.

(b)Marked dimension must be total of new blending plus any previous dimensions already marked on blade platform.

CAUTION : BLADE PLATFORM MAY HAVE BEEN MARKED TO SHOW ADDITIONAL REPAIR CODES OTHER THAN BLEND DEPTH. DO NOT OBLITERATE SUCH ADDITIONAL CODES.

(c)Obliterate any previous blend dimensions marked on blade platform.

2. Replace Stage 1 (Fan) Blade Rubber Seal

A. Equipment and Materials

ITEM	DESIGNATION
(1)Material No.P05-055	Special Materials (Ref. 70-00-00)
(2)Material No.P08-005	Bonding and Adhesive Compounds (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - Standard Practices

B. Procedure (Ref. Fig. 807)

(1)Remove damaged fan blade platform rubber seal.

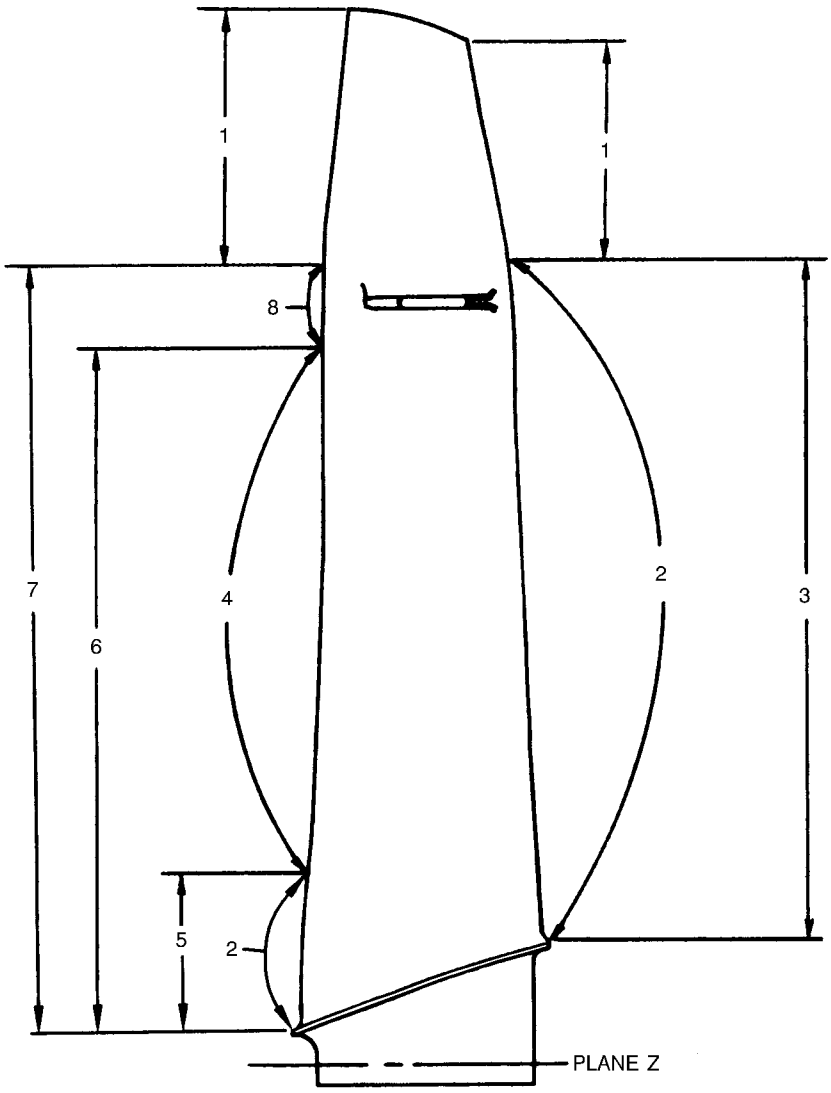
(2)Clean lower left face of blade platform by SPOP 208 (Ref. 70-00-00, P. Block 201).

NOTE : Left side is determined by viewing blade from rear with blade trailing edge nearest operator.

(3)Lightly abrade rubber seal contact surface using Emery Paper (Material No.P05-055) to remove gloss and then clean by SPOP 208 (Ref. 70-00-00, P. Block 201).

(4)In a clean dry area apply a thin uniform coat of Adhesive

1. OUTER HALF OF BLADE-LENGTH-TO-DEPTH RATIO MUST BE AT LEAST 4:1
2. AIRFOIL CRITICAL AREA-LENGTH-TO-DEPTH RATIO MUST BE AT LEAST 12:1
3. 19.515in. (495.681mm)
4. INNER HALF OF BLADE-LENGTH-TO-DEPTH RATIO MUST BE AT LEAST 6:1
5. 6.300in. (160.020mm)
6. 18.500in. (469.9mm)
7. 22.500in. (571.500mm)
8. LEADING EDGE AT PART SPAN SHROUD-LENGTH-TO-DEPTH RATIO MUST BE AT LEAST 12:1



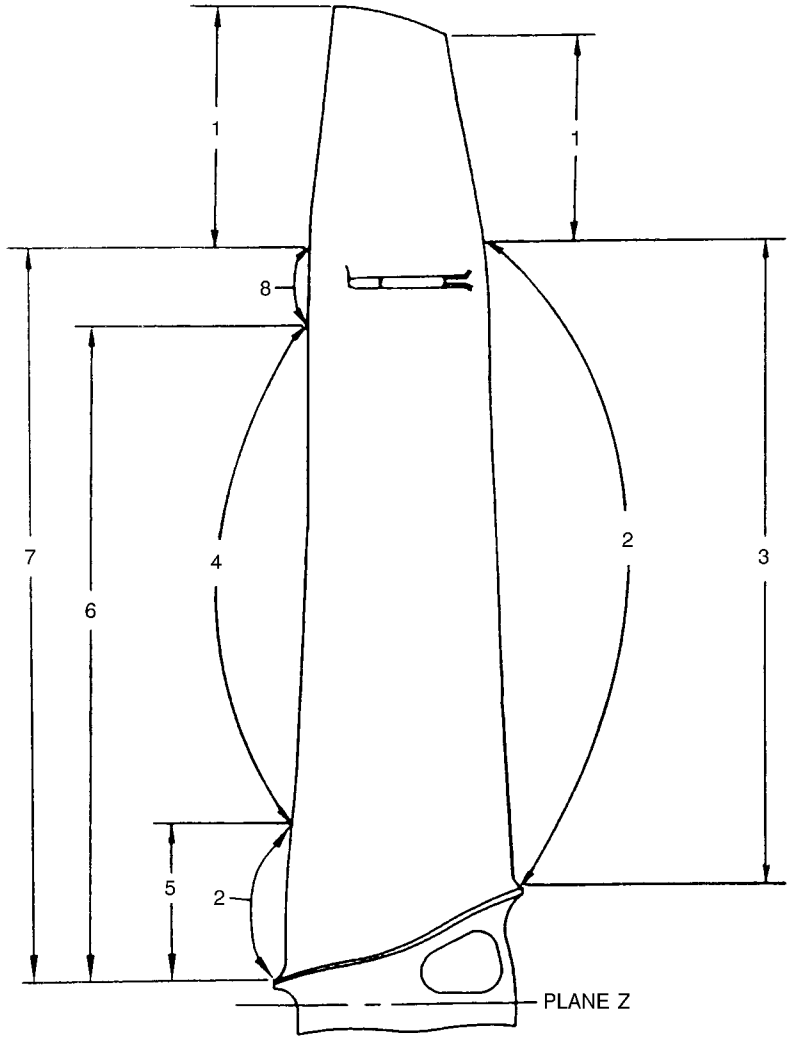
NOTE: FOR PN 52A121, 52A121-001, 53A321, 56A511, 56A821, 52A121-002, 52A121-003 AND 53A321-001.

L-A2321 (0896)

BM5 72 21 02 8 KJMA 02

Radial Length-to-Depth Ratios
(Sheet 1/2)
Figure 803

1. OUTER HALF OF BLADE-LENGTH-TO-DEPTH RATIO MUST BE AT LEAST 4:1
2. AIRFOIL CRITICAL AREA-LENGTH-TO-DEPTH RATIO MUST BE AT LEAST 12:1
3. 19.865in. (504.571mm)
4. INNER HALF OF BLADE-LENGTH-TO-DEPTH RATIO MUST BE AT LEAST 6:1
5. 6.300in. (160.020mm)
6. 18.850in. (478.790mm)
7. 22.850in. (580.390mm)
8. LEADING EDGE AT PART SPAN SHROUD-LENGTH-TO-DEPTH RATIO MUST BE AT LEAST 12:1



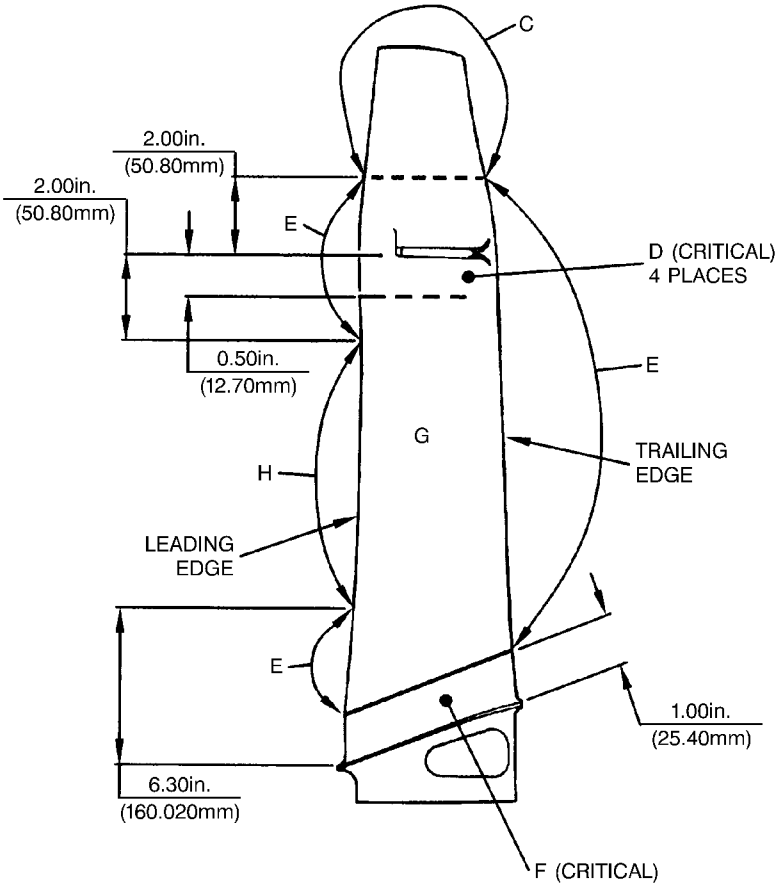
BM5 72 21 02 8 KJMC 01

L-B2957 (0896)

Radial Length-to-Depth Ratios
(PN 54A821 and 56A621) (Sheet 2/2)
Figure 803

INSPECT	MAXIMUM DEPTH OF DAMAGE		
	SERVICEABLE LIMIT	REPAIRABLE LIMIT	REPAIRABLE LIMIT (BUT WITH A 50 HOUR CONTINUE-IN-SERVICE LIMIT)
AREA C THE TIP	0.020in. (0.508mm)	0.750in. (19.050mm)	1.000in. (25.400mm)
AREA D SHROUD TO AIRFOIL RADIUS	NOT DAMAGE PERMITTED	NOT DAMAGE PERMITTED	NOT DAMAGE PERMITTED
AREA E LEADING AND TRAILING EDGES	0.005in. (0.127mm)	0.250in. (6.350mm)	0.300in. (7.629mm)
AREA F PLATFORM TO AIRFOIL RADIUS LEADING AND TRAILING EDGES	NOT DAMAGE PERMITTED 0.005in. (0.127mm)	NOT DAMAGE PERMITTED 0.150in. (3.810mm)	NOT DAMAGE PERMITTED NONE
AREA G OTHER AIRFOIL SURFACES	0.020in. (0.508mm)	0.030in. (0.762mm)	0.060in. (1.524mm)
AREA H LEADING EDGE SURFACES	0.005in. (0.127mm)	0.250in. (6.350mm) SEE NOTE 1	0.300in. (7.629mm) SEE NOTE 1

NOTE 1 : THIS LIMIT MAY BE FOUND TO BE 0.500in. (12.7mm) MAXIMUM IN THE CIR MANUAL. THE HIGHER LIMIT IS ALLOWED FOR THE NECESSARY BEAD PEEN AND ECI AT OVERHAUL FACILITY.



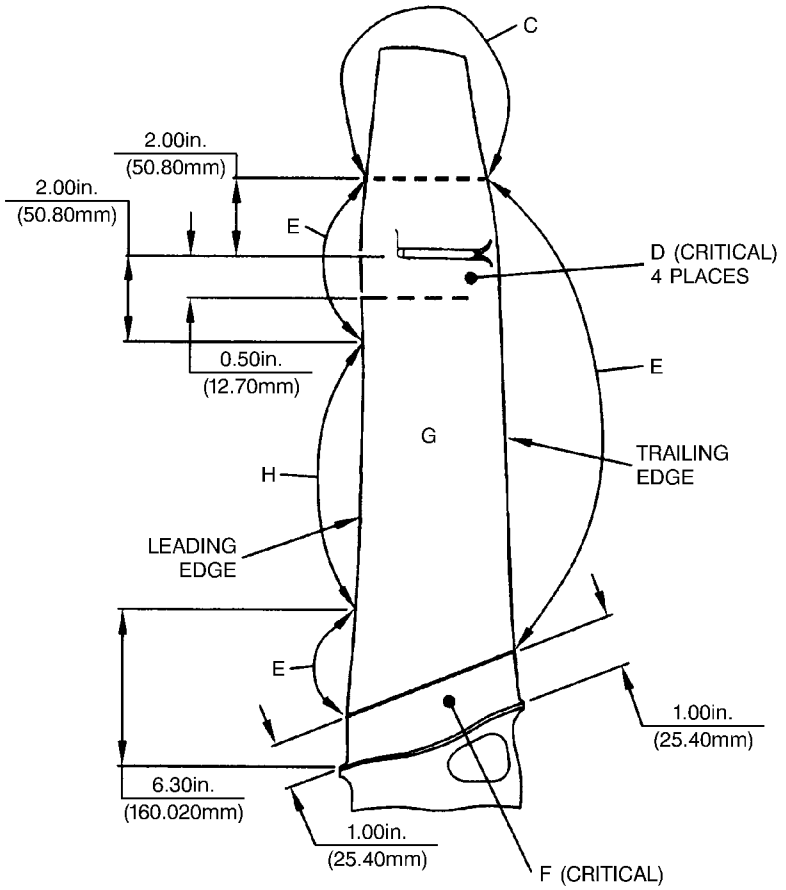
L-B2954 (0896)

BM5 72 21 02 8 KEMA 01

Airfoil Damage Limits
(PN 53A321, 56A511, 56A821 and 53A321-001) (Sheet 1/2)
Figure 804

INSPECT	MAXIMUM DEPTH OF DAMAGE		
	SERVICEABLE LIMIT	REPAIRABLE LIMIT	REPAIRABLE LIMIT (BUT WITH A 50 HOUR CONTINUE-IN-SERVICE LIMIT)
AREA C THE TIP	0.020in. (0.508mm)	0.750in. (19.050mm)	1.000in. (25.400mm)
AREA D SHROUD TO AIRFOIL RADIUS	NOT DAMAGE PERMITTED	NOT DAMAGE PERMITTED	NOT DAMAGE PERMITTED
AREA E LEADING AND TRAILING EDGES	0.005in. (0.127mm)	0.250in. (6.350mm)	0.300in. (7.629mm)
AREA F PLATFORM TO AIRFOIL RADIUS LEADING AND TRAILING EDGES	NOT DAMAGE PERMITTED 0.005in. (0.127mm)	NOT DAMAGE PERMITTED 0.150in. (3.810mm)	NOT DAMAGE PERMITTED NONE
AREA G OTHER AIRFOIL SURFACES	0.020in. (0.508mm)	0.030in. (0.762mm)	0.060in. (1.524mm)
AREA H LEADING EDGE SURFACES	0.005in. (0.127mm)	0.250in. (6.350mm) SEE NOTE 1	0.300in. (7.629mm) SEE NOTE 1

NOTE 1 : THIS LIMIT MAY BE FOUND TO BE 0.500in. (12.7mm) MAXIMUM IN THE CIR MANUAL. THE HIGHER LIMIT IS ALLOWED FOR THE NECESSARY BEAD PEEN AND ECI AT OVERHAUL FACILITY.



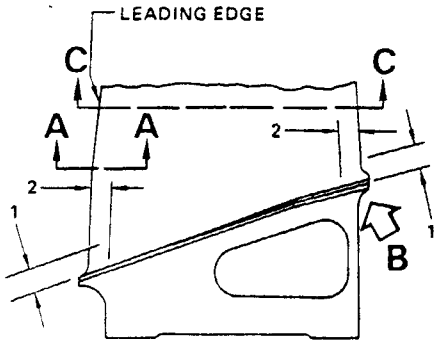
L-B2955 (0896)

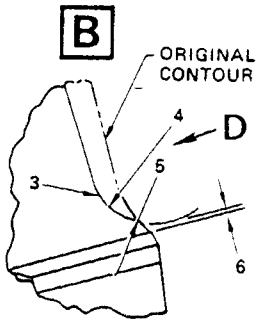
BM5 72 21 02 8 KEMC 01

Airfoil Damage Limits
(PN 54A821 and 56A621) (Sheet 2/2)
Figure 804

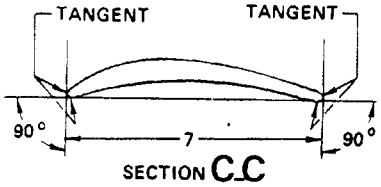
1. 1.000 IN (25.400 MM) - DAMAGE IN AIRFOIL-TO-PLATFORM RADIUS AREA CANNOT BE BLENDED EXCEPT TO DEPTH OF INDEX 2.
2. 0.150 IN (3.810 MM) MAXIMUM ALLOWABLE BLEND DEPTH
3. ROUND EDGES OF BLEND WITH INDEX 5 RADIUS WITHOUT UNDERCUTTING AIRFOIL-TO-PLATFORM FILLET RADIUS WHEN BLENDING NEAR PLATFORM.
4. 0.359 - 0.391 IN (9.12 - 9.93 MM) RADIUS
5. 0.030 - 0.050 IN (0.762 - 1.27 MM) RADIUS
6. 0.000 - 0.020 IN (0.000 - 0.508 MM) NORMAL TO PLATFORM
7. MINIMUM CHORD LENGTH TO BE 6.950 IN (176.530 MM) WITHIN 6.300 IN (160.020 MM) OF LEADING EDGE PLATFORM. CHORD LENGTH MUST BE MEASURED TANGENT TO BLADE LEADING AND TRAILING EDGES AND PARALLEL TO PLANE Z.
8. MAINTAIN FULL DIAMETER - IF DIAMETER EXCEEDS 0.062 IN (1.575 MM) MAXIMUM. BLEND AS SPECIFIED IN INDEX 10.
9. MINIMUM EDGE THICKNESS MUST BE MAINTAINED.

10. 0.130 - 0.190 IN (3.302 - 4.826 MM) - BLEND RADIUS AT INDEX 8 SMOOTH OVER THIS DISTANCE ON BOTH SIDES OF AIRFOIL USING HAND FILE AND EMERY CLOTH.

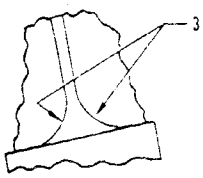




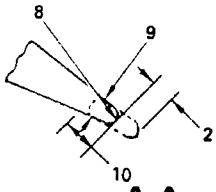
TYPICAL LEADING AND TRAILING EDGE



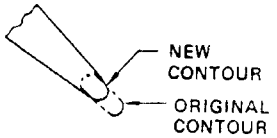
SECTION C-C
CHORD LENGTH MEASUREMENT



VIEW D



SECTION A-A
TYPICAL LEADING AND TRAILING EDGE



NOTE: FOR PN 52A121, 52A121-001, 53A321, 56A511, 56A821, 52A121-002, 52A121-003 AND 53A321-001.

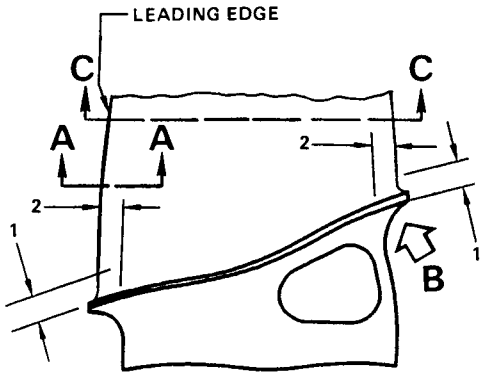
L--A2320

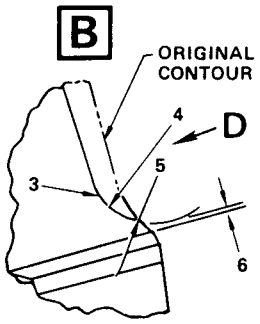
BM5 72 21 02 8 KGMA 01

Leading and Trailing Edge Root Blend Limits
(Sheet 1/2)
Figure 805

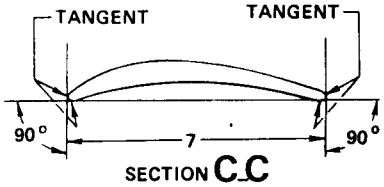
1. 1.000 IN (25.400 MM) - DAMAGE IN AIRFOIL-TO-PLATFORM RADIUS AREA CANNOT BE BLENDED EXCEPT TO DEPTH OF INDEX 2.
2. 0.150 IN (3.810 MM) MAXIMUM ALLOWABLE BLEND DEPTH
3. ROUND EDGES OF BLEND WITH INDEX 5 RADIUS WITHOUT UNDERCUTTING AIRFOIL-TO-PLATFORM FILLET RADIUS WHEN BLENDING NEAR PLATFORM.
4. 0.359 - 0.391 IN (9.12 - 9.93 MM) RADIUS
5. 0.030 - 0.050 IN (0.762 - 1.27 MM) RADIUS
6. 0.000 - 0.020 IN (0.000 - 0.508 MM) NORMAL TO PLATFORM
7. MINIMUM CHORD LENGTH TO BE 6.950 IN (176.530 MM) WITHIN 6.300 IN (160.020 MM) OF LEADING EDGE PLATFORM. CHORD LENGTH MUST BE MEASURED TANGENT TO BLADE LEADING AND TRAILING EDGES AND PARALLEL TO PLANE Z.
8. MAINTAIN FULL DIAMETER - IF DIAMETER EXCEEDS 0.062 IN (1.575 MM) MAXIMUM. BLEND AS SPECIFIED IN INDEX 10.
9. MINIMUM EDGE THICKNESS MUST BE MAINTAINED.

10. 0.130 - 0.190 IN (3.302 - 4.826 MM) - BLEND RADIUS AT INDEX 8 SMOOTH OVER THIS DISTANCE ON BOTH SIDES OF AIRFOIL USING HAND FILE AND EMERY CLOTH.

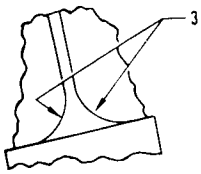




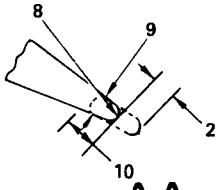
TYPICAL LEADING AND TRAILING EDGE



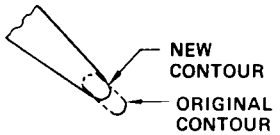
SECTION C-C
CHORD LENGTH MEASUREMENT



VIEW D



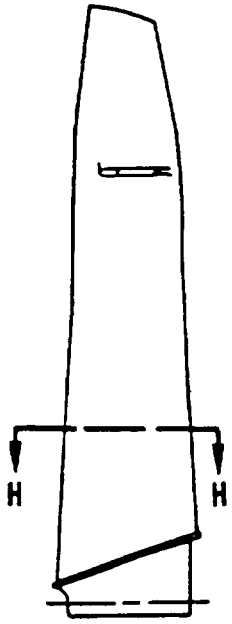
SECTION A-A
TYPICAL LEADING AND TRAILING EDGE

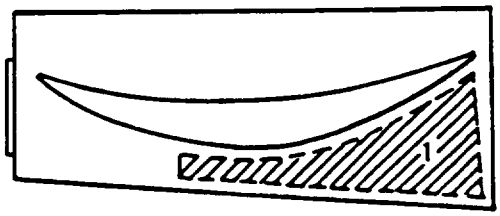


L-B2956 (0000)

BM5 72 21 02 8 KGMC 00

Leading and Trailing Edge Root Blend Limits
(PN 54A821 and 56A621) (Sheet 2/2)
Figure 805





SECTION H-H

L-A2322

BM5 72 21 02 8 KLM0 00

1. Blade Repair Marking May Be Made Within This Area. Marking Area Is Defined As 0.100 Inch (2.540 mm) From Platform Edges And Airfoil-To-Platform Fillet Radius.

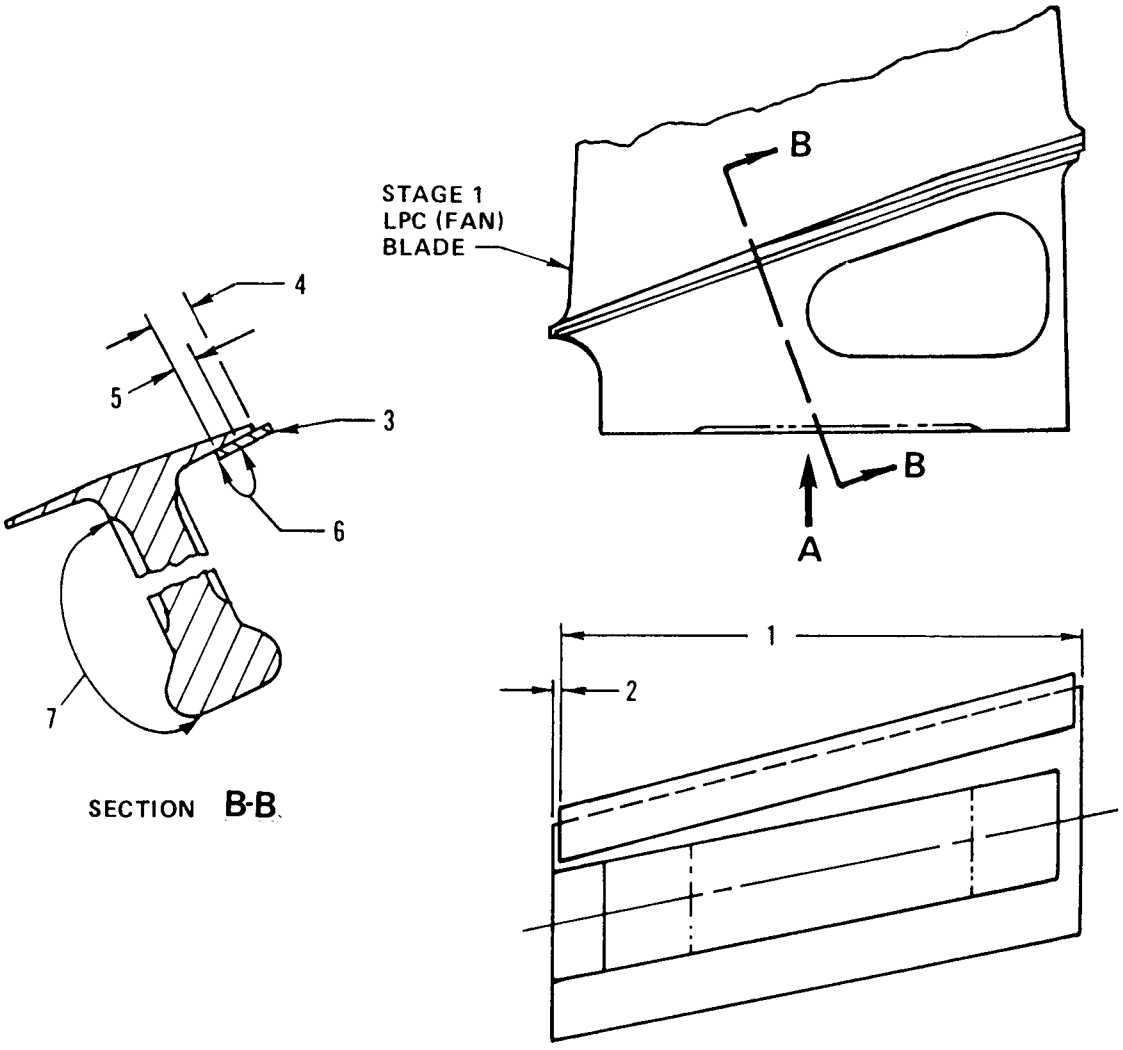
Repair Marking Area
Figure 806

(Material No.P08-005), 0.003 - 0.005 in. (0.076 - 0.127 mm) thick over entire contacting surfaces in area shown for each part.

(5)Allow adhesive to dry until tacky to touch.

(6)Join cemented surfaces of blade platform and rubber seal. Press firmly together and allow to cure at room temperature for twenty-four hours.

(7)Remove surplus adhesive where evident.



1. LENGHT OF APPLICATION OF ADHESIVE UNDERNEATH PLATFORM.
2. 0.000-0.040 IN.(0.000-1.02 MM)BOTH ENDS.
3. PN 5002083-01 SEAL.
4. 0.480-0.520 IN.(12.19-13.21 MM).
5. 0.300-0.350 IN.(7.62-8.89 MM).
6. WIDTH OF ADHESIVE APPLICATION FOR PLATFORM LENGHT.
7. NO METHYL ETHYL KETONE ALLOWED IN ENCLOSED AREA-BOTH SIDES.

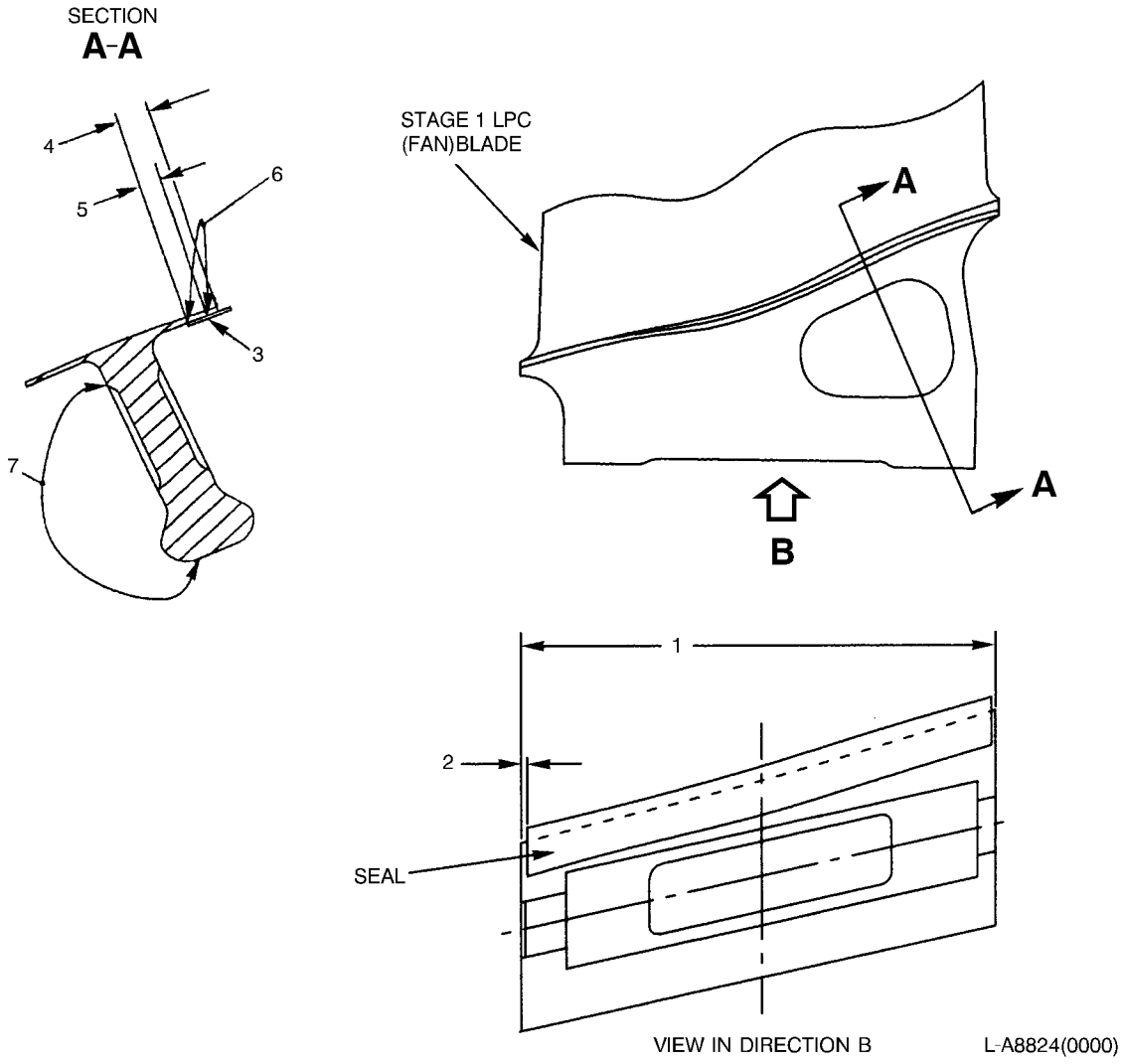
NOTE: FOR PN 52A121, 52A121-001, 53A321, 56A511, 56A821, 52A121-002, 52A121-003 AND 53A321-001.

L-A3791

BM5 72 21 02 8 KNMA 01

Blade Platform Seal Replacement
(Sheet 1/2)
Figure 807

1. LENGHT OF APPLICATION OF ADHESIVE UNDERNEATH PLATFORM
2. 0.000-0.040in.(0.000-1.02mm)BOTH ENDS.
3. PN 5002083-01 SEAL.
4. 0.480-0.520in.(12.19-13.21mm)
5. 0.300-0.350in.(7.62-8.89mm).
6. WIDTH OF ADHESIVE APPLICATION FOR PLATFORM LENGHT.
7. NO METHYL ETHYL KETONE ALLOWED IN ENCLOSED AREA-BOTH SIDES.



BM5 72 21 02 8 KNMC 00

Blade Platform Seal Replacement
(PN 54A821 and 56A621) (Sheet 2/2)
Figure 807

3. Restore Stage 1 (Fan) Blade Assembly Leading Edge Contour

NOTE : This restoration repair is for engines that have had unsatisfactory fan performance operation. This repair can also be used to clean and remove fan blade leading edge damage.
This repair is applicable to fan blade assemblies PN 52A121, 56A621, 56A821, 52A121-001, 52A121-002, 52A121-003 and 53A321-001 only.
Other part numbers 53A321, 54A821 and 56A511 fan blades must be reoperated by SB PW4ENG 72-655 and reidentified to the new part numbers before you do this repair.

A. Equipment and Materials

ITEM	DESIGNATION
(1)PWA29646	Gage, Inspection
(2)PWA29836	Sighting Template
(3)PWA29914	Angle Cutter
(4)PWA49065	Template, Plastic Chord (for PN 52A121 and 56A821 Blades)
(5)PWA75431	Marking Template (for PN 52A121 and 52A121-001 Blades)
(6)PWA75432	Radius Cutter (for PN 52A121 and 52A121-001 Blades)
(7)PWA86053	Marking Template (for PN 56A821 Blade)
(8)PWA86054	Handle, Edge Scraper (for PN 56A621, 56A821, 54A821, 53A321, 53A321-001, 56A511, 52A121-003, and 52A121-002 Blades)
(9)PWA86055	Insert, Edge Scraper (for PN 56A621, 56A821, 53A321-001, 52A121-002 and 52A121-003 Blades)
10)PWA101157	Insert, Edge Scraper (for PN 56A621, 56A821, 52A121-002, 52A121-003 and 53A321-001 Blades)
11)PWA101801	Marking Template (for PN 56A621 Blade)
12)	Vise (3013) or Soft-Jaw Vise
13)	Masking Tape
14)	Files
15)	Non-etching and Non-corrosive Ink (or Coating Fluid)
16)Material No.P05-062	Special Materials (Ref. 70-00-00)
17)Material No.P05-252	Special Materials (Ref. 70-00-00)
R 18)Material No.P06-054	Lubricants (Ref. 70-00-00)
19)Material No.P06-005	Lubricants (Ref. 70-00-00)
20)Material No.P11-049	Cleaning Agents (Ref. 70-00-00)
Referenced Procedures	
- 72-21-01, P. Block 401	Inlet Cone
- 72-21-02, P. Block 401	First Stage Compressor Rotor (Fan) Blade Assembly
- 72-21-02, P. Block 601	First Stage Compressor Rotor (Fan) Blade Assembly

B. Job Set-up
(1)Remove the compressor inlet cone (Ref. 72-21-01, P. Block 401).
(2)Remove all first stage compressor rotor (fan) blade assemblies (Ref. 72-21-02, P. Block 401).

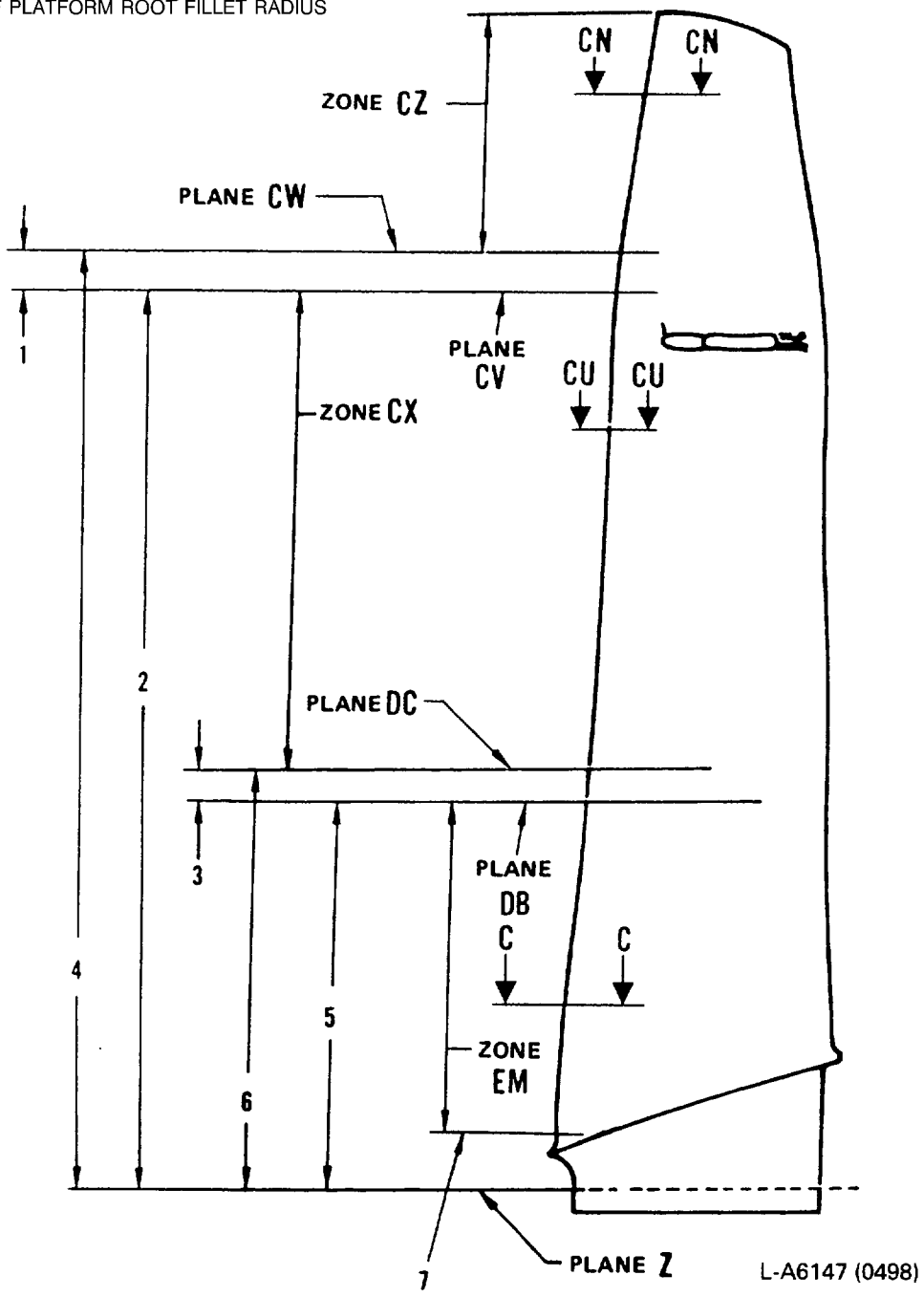
C. Procedure (Ref. Fig. 808, 809, 810)
(Ref. Fig. 811, 812)
WARNING : TO AVOID POSSIBILITY OF INJURY TO HANDS, GLOVES SHOULD BE WORN WHEN HANDLING BLADES AND USING TOOLS.
CAUTION : USE OF POWER TOOLS OR GRINDING IS NOT PERMITTED.
(1)Clean the blade with a Scotch Brite Pad (Material No.P05-252) and Wipe Cleaner (Material No.P11-049). Pay special attention to the leading edge and the first three inches (76.2 mm) of the convex side of the blade.
(2)Visually inspect blade for defects (Ref. 72-21-02, P. Block 601). Repair or replace blade if beyond acceptable service limits.
(3)Check each blade leading edge with PWA29836 sighting template and PWA29646 thickness gage to assure that sufficient material exists to incorporate new leading edge configuration.
NOTE : Thinning or dressing can be accomplished with hand held scraping tools, files and abrasive paper or Emery cloth (Material No.P05-062).
(4)Clean and paint both sides of the blade leading edge with non-etching, non-corrosive ink, or equivalent coating fluid in preparation for marking work area.
CAUTION : DO NOT USE AN AWL OR METAL SCRIBER WHEN MARKING LOCATIONS ON BLADE, IT CAN LEAVE A STRESS RISER ON BLADE. USE A SHARPENED PIECE OF HARD PLASTIC OR OTHER NON-METALLIC MATERIAL.
(5)With applicable marking template, scribe a line on the blade to mark the blades transition zones. See the tools shown below :
(a)Use a PWA75431 Marking Template for PN 52A121 and 52A121-001 blades.
(b)Use a PWA86053 Marking Template for PN 56A821 blade.
(c)Use a PWA101801 Marking Template for PN 56A621 blade.
(6)Apply masking tape aft of blade leading edge to protect the blade during rework.
(7)Install blade in Vise 3013 or equivalent soft-jaw vise that will permit blade to be correctly positioned during repair.
(8)Machine blade leading edge as shown in referenced figure for entire length of blade. Remove material as necessary with PWA29914 Cutter to form the 10 degree angle. To form the blade leading edge radius, use the tools that follow for the applicable blades :
NOTE : Hand held scrapping tools, files and abrasive paper or cloth can be used but material removal must be uniform along the leading edge.
(a)For PN 52A121, 52A121-001 blades, use PWA75432 Cutter.
(b)For PN 56A621, 53A321-001, 52A121-002, 52A121-003, or 56A821 blades over zone CZ only, use PWA86054 Handle with PWA86055 Edge Scraper Insert.
(c)For PN 56A621, 53A321-001, 52A121-002, 52A121-003, or 56A821 blades over zone CX only,use PWA86054 Handle with PWA101157 Edge Scraper Insert.
(9)Do not remove more material than necessary and limit removal to

0.100 in. (2.540 mm) maximum.
NOTE : A tapered cut, starting at tip and extending to blade root filled is optional.
(a)If necessary, after material has been removed, use the optional PWA49065 Template (for PN 52A121, 52A121-001, 52A121-002, 52A121-003, 53A321-001 and 56A821 blades) to check the blade chord length. The minimum chord length at each section of blade as specified in applicable figure must be maintained (***//KTM0//KVM0//KXM0//***).
(10)Polish repair area to remove scratches and machine marks (Ref. 70-00-00, P. Block 201).
(11)Blend repair blade airfoil area as necessary (Ref. Para. Blend Repair Blade Airfoil).

R (12)With a brush, apply Antiseize Compound (Material No.P06-054) to the blade root area. The cure requirement is waived.
(13)Use one of the two methods that follow to lubricate the blade mid-span shroud :
WARNING : DO NOT PERMIT THE LUBRICANT (MATERIAL No.P06-005) TO TOUCH YOUR SKIN. IF IT DOES, WASH IMMEDIATELY WITH SOAP AND WATER.
(a)With a brush, apply Lubricant (Material No.P06-005) to the contact faces of the mid-span shroud of the blade. Wait five minutes before you install the blade.
R (b)With a brush, apply Antiseize Compound (Material No.P06-054) to the contact faces of the mid-span shroud of the blade. The cure requirement is waived.
(14)If necessary, install new blade platform seal (Ref. Para. Replace Stage 1 Fan Blade Rubber Seal).
(15)Measure depth of cut made in leading edge.
(16)Use the vibropeen marking method to record the depth of cut on the blade platform.

D.Close-up
(1)Install all first stage compressor rotor (fan) blade assemblies (Ref. 72-21-02, P. Block 401).
(2)Install the compressor inlet cone (Ref. 72-21-01, P. Block 401).

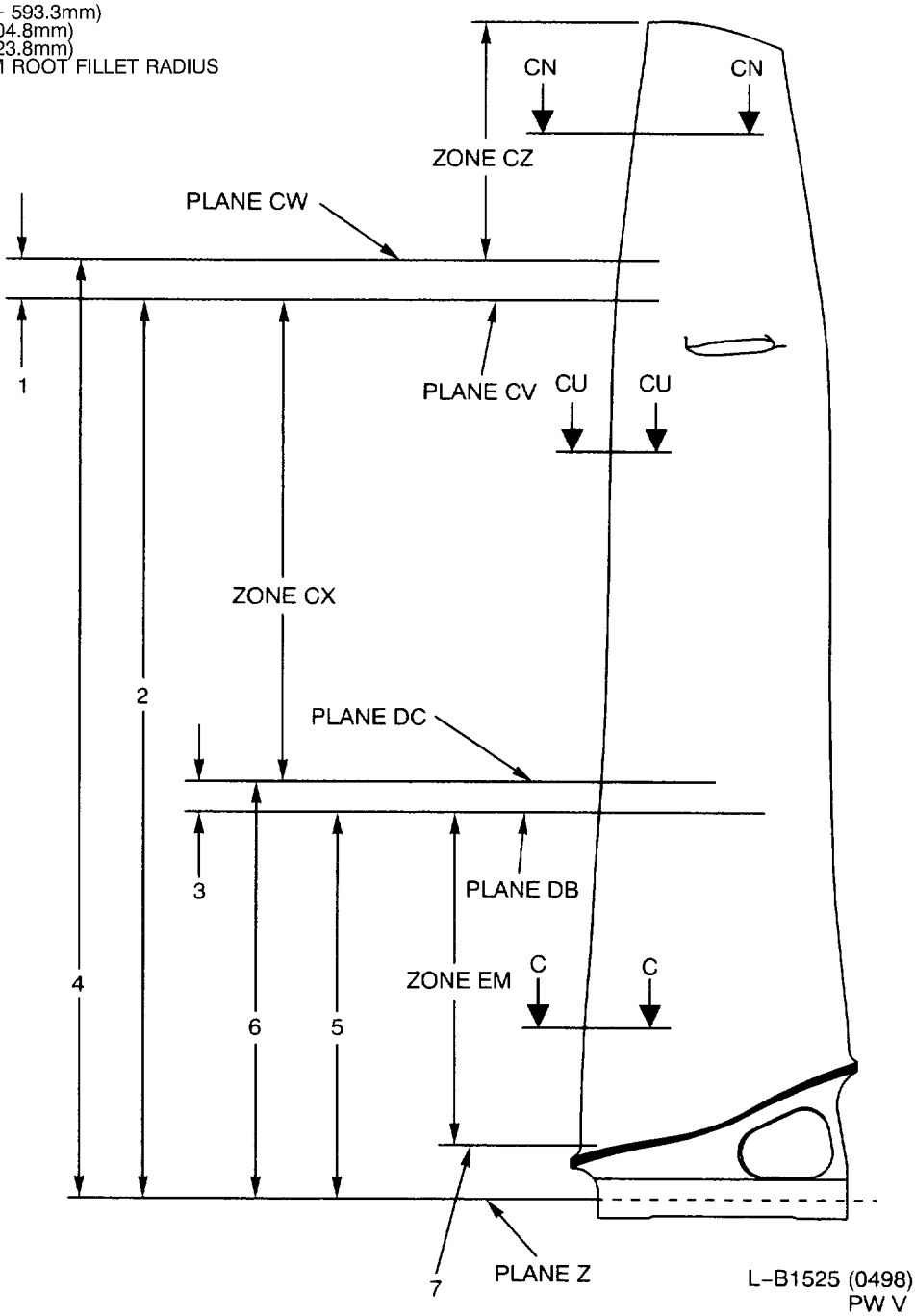
1. MAKE SMOOTH BETWEEN ZONES CZ AND CX WITHIN INDEX 1. MINIMUM THICKNESS WITHIN INDEX 1 IS NOT TO BE LESS THAN THE ACTUAL THICKNESS OF LEADING EDGE AT LOCATION DA OF ADJACENT ZONE ABOVE PLANE CW.
2. 23.465 - 23.715in. (596.0 - 602.4mm)
3. MAKE SMOOTH BETWEEN ZONES CX AND EM WITHIN INDEX 3. MINIMUM THICKNESS WITHIN INDEX 3 IS NOT TO BE LESS THAN THE ACTUAL THICKNESS OF LEADING EDGE AT LOCATION DE OF ADJACENT ZONE ABOVE PLANE DC.
4. 24.215 - 24.465in. (615.1 - 621.4mm)
5. 7.812 - 8.062in. (198.4 - 204.8mm)
6. 8.562 - 8.812in. (217.5 - 223.8mm)
7. TANGENT OF PLATFORM ROOT FILLET RADIUS



BM5 72 21 02 8 KPMA 01

Leading Edge Contour Repair
(For PN 56A821 and 53A321-001 Blades) (Sheet 1/4)
Figure 808

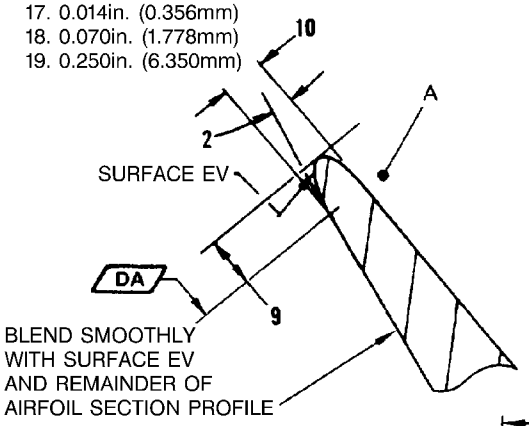
1. MAKE SMOOTH BETWEEN ZONES CZ AND CX WITHIN INDEX 1. MINIMUM THICKNESS WITHIN INDEX 1 IS NOT TO BE LESS THAN THE ACTUAL THICKNESS OF LEADING EDGE AT LOCATION DA OF ADJACENT ZONE ABOVE PLANE CW.
2. 22.859 - 22.609in. (580.6 - 574.3mm)
3. MAKE SMOOTH BETWEEN ZONES CX AND EM WITHIN INDEX 3. MINIMUM THICKNESS WITHIN INDEX 3 IS NOT TO BE LESS THAN THE ACTUAL THICKNESS OF LEADING EDGE AT LOCATION DE OF ADJACENT ZONE ABOVE PLANE DC.
4. 23.609 - 23.359in. (599.7 - 593.3mm)
5. 7.812 - 8.062in. (198.4 - 204.8mm)
6. 8.562 - 8.812in. (217.5 - 223.8mm)
7. TANGENT OF PLATFORM ROOT FILLET RADIUS



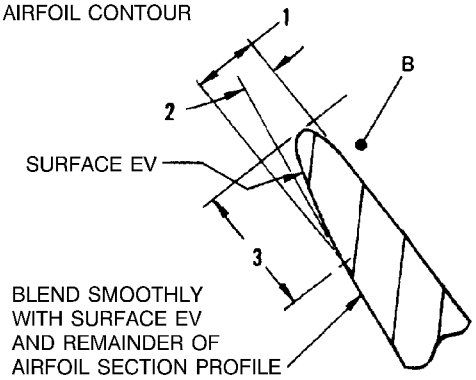
BM5 72 21 02 8 KPMC 01

Leading Edge Contour Repair
(For PN 56A621 Blade) (Sheet 2/4)
Figure 808

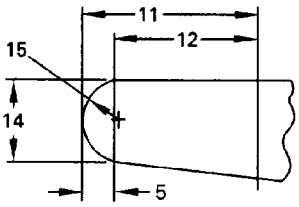
1. 0.041-0.047in. (1.042-1.193mm)(CHAMFER IF NECESSARY TO MAINTAIN THIS DIMENSION FROM PLANE CV TO PLANE DC).
2. 8-12
3. 0.086in. (2.184mm)
4. 0.007in. (0.178mm)RADIUS
5. 0.040in. (1.016mm)
6. 0.750in. (19.050mm)
7. 0.015in. (0.381mm)
8. 0.020-0.026in. (0.508-0.660mm)
9. 0.032in. (0.813mm)
10. 0.025-0.031in. (0.635-0.787mm)
11. 0.380in. (9.652mm)MINIMUM
12. BLEND SMOOTHLY IN THIS DISTANCE. PROFILE THICKNESS OVER THIS DISTANCE MUST BE NOT LESS THAN THE THICKNESS MEASURED AT INDEX 13.
13. 0.034-0.041in. (0.864-1.016mm)
14. 0.032in. (0.813mm)MINIMUM
15. THIS RADIUS MUST BE BLENDED SMOOTHLY WITH THE REMAINING AIRFOIL CONTOUR
16. 0.073in. (1.854mm)
17. 0.014in. (0.356mm)
18. 0.070in. (1.778mm)
19. 0.250in. (6.350mm)



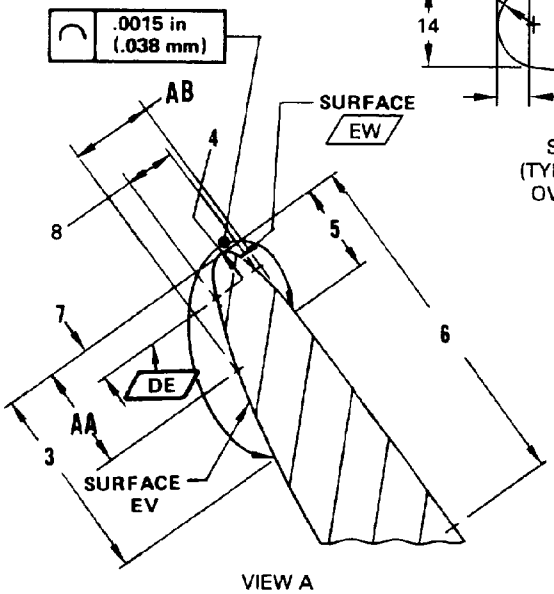
SECTION CN-CN
TYPICAL SECTION OVER ZONE CZ



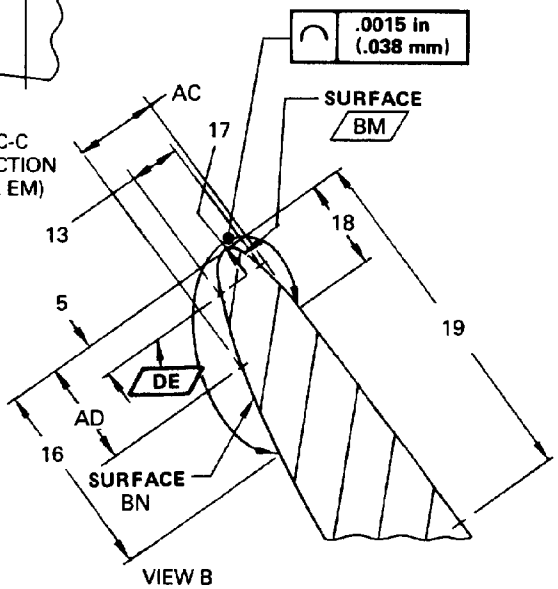
SECTION CU-CU
TYPICAL SECTION OVER ZONE CX



SECTION C-C
(TYPICAL SECTION
OVER ZONE EM)



VIEW A
TYPICAL ENLARGED VIEW OVER ZONE CZ



VIEW B
TYPICAL ENLARGED VIEW OVER ZONE CX L-A6148 (0498)

BM5 72 21 02 8 KPME 01

Leading Edge Contour Repair
(For PN 56A621, 56A821 and 53A321-001 Blades) (Sheet 3/4)
Figure 808

SURFACE EV	
AA	AB
Inch/(MM)	Inch/(MM)
0.0021 (0.053)	0.0162 (0.411)
0.0074 (0.188)	0.0202 (0.513)
0.0168 (0.427)	0.0251 (0.638)
0.0263 (0.688)	0.0290 (0.737)
0.0359 (0.912)	0.0323 (0.820)
0.0456 (1.158)	0.0352 (0.894)
0.0553 (1.405)	0.0378 (0.960)
0.0651 (1.654)	0.0401 (1.019)
0.0749 (1.902)	0.0422 (1.072)
0.0862 (2.189)	0.0443 (1.125)

SURFACE EW	
AA	AB
Inch/(MM)	Inch/(MM)
0.0039 (0.099)	0.0048 (0.122)
0.0102 (0.259)	0.0027 (0.069)
0.0206 (0.523)	0.0009 (0.023)
0.0309 (0.785)	0.0002 (0.0051)
0.0397 (1.008)	0.0000 (0.0000)

SURFACE BM	
AC	AD
Inch/(MM)	Inch/(MM)
0.0131 (0.333)	0.0004 (0.010)
0.0175 (0.444)	0.0002 (0.0051)
0.0263 (0.668)	0.000 (0.000)

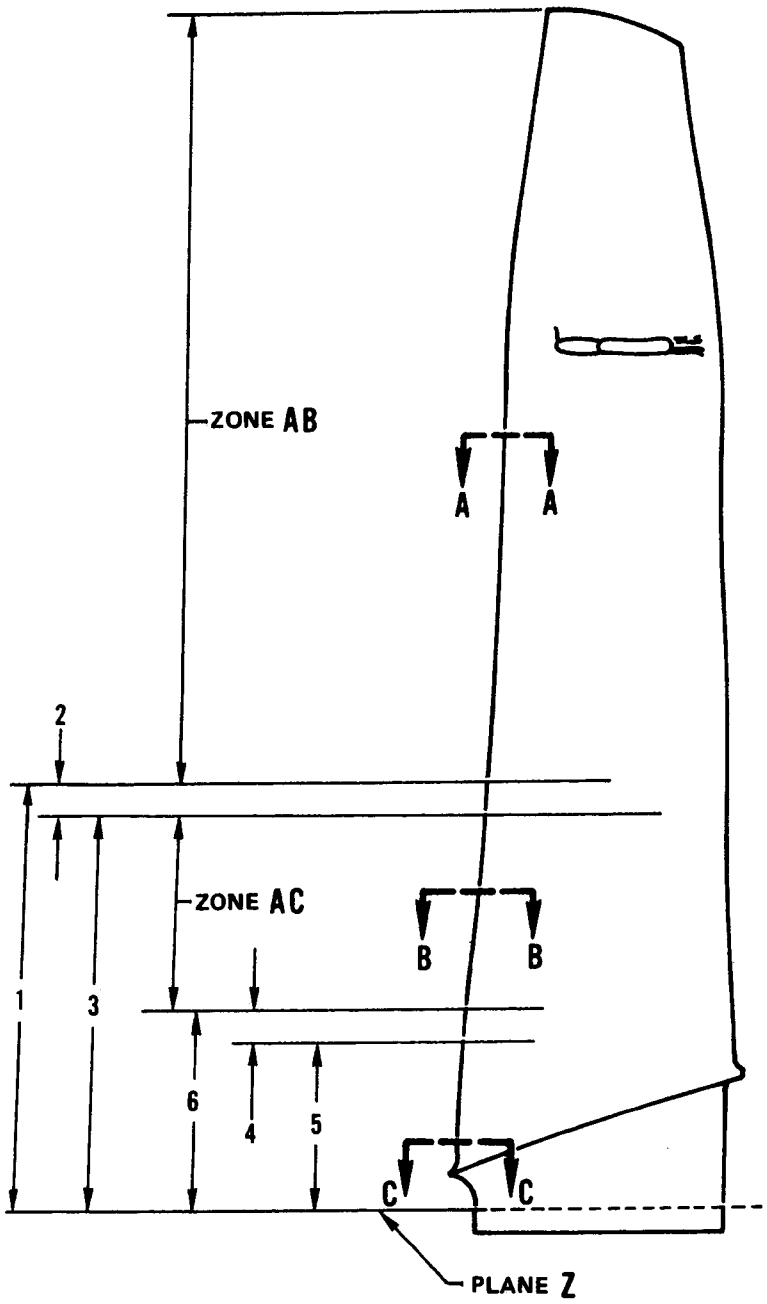
SURFACE BN	
AC	AD
Inch/(MM)	Inch/(MM)
0.0087 (0.221)	0.0274 (0.696)
0.0129 (0.328)	0.0290 (0.737)
0.0225 (0.572)	0.0323 (0.820)
0.0322 (0.818)	0.0352 (0.894)
0.0419 (1.064)	0.0378 (0.960)
0.0517 (1.313)	0.0401 (1.019)
0.0615 (1.562)	0.0422 (1.072)
0.0728 (1.849)	0.0443 (1.125)

BM5 72 21 02 8 KPMG 01

L-A6149 (0498)
PW V

Leading Edge Contour Repair
(For PN 56A621, 56A821 and 53A321-001 Blades) (Sheet 4/4)
Figure 808

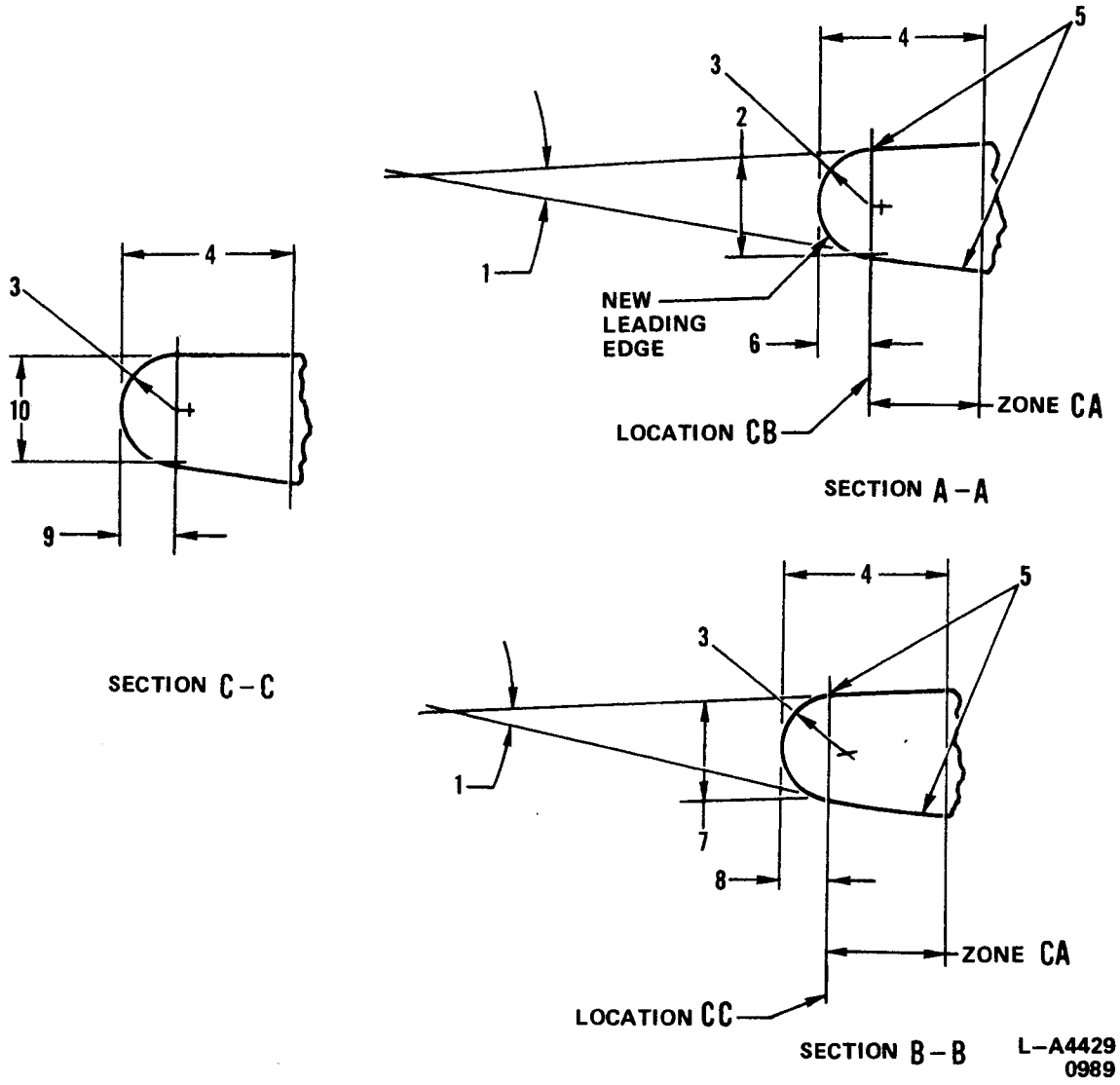
1. 10.545 - 10.795in. (267.8 - 274.2mm)
2. TRANSITION IN THIS AREA MUST BE BLENDED SMOOTHLY. MINIMUM THICKNESS IN THIS AREA IS NOT TO BE LESS THAN THE ACTUAL THICKNESS OF LEADING EDGE AT LOCATION CB IN ZONE AB.
3. 9.795 - 10.045in. (248.8 - 255.1mm)
4. TRANSITION IN THIS AREA MUST BE BLENDED SMOOTHLY. MINIMUM THICKNESS IN THIS AREA IS NOT TO BE LESS THAN THE ACTUAL THICKNESS OF LEADING EDGE AT LOCATION CC IN ZONE AC.
5. 4.100 - 4.350in. (104.1 - 110.5mm)
6. 4.850 - 5.100in. (123.2 - 129.5mm)



BM5 72 21 02 8 KRMA 00

Leading Edge Contour Repair
(For PN 52A121 and 52A121-001 Blades) (Sheet 1/2)
Figure 809

1. 8 - 12
2. 0.022 - 0.028in. (0.559 - 0.711mm)
3. THIS RADIUS MUST BE BLENDED SMOOTHLY WITH REMAINDER OF AIRFOIL CONTOUR.
4. 0.380in. (9.652mm) MAXIMUM
5. BLEND SMOOTHLY WITHIN REMAINDER OF AIRFOIL SECTION. PROFILE THICKNESS IN ZONE CA MUST NOT BE LESS THAN THICKNESS MEASURED AT LOCATIONS CB OR CC AS APPLICABLE.
6. 0.013in. (0.330mm), MEASURE THICKNESS AT THIS DIMENSION.
7. 0.033 - 0.039in. (0.838 - 0.991mm)
8. 0.018in. (0.457mm), MEASURE THICKNESS AT THIS DIMENSION
9. 0.0165in. (0.419mm), MEASURE THICKNESS AT THIS LOCATION.
10. 0.033in. (0.838mm), MINIMUM THICKNESS

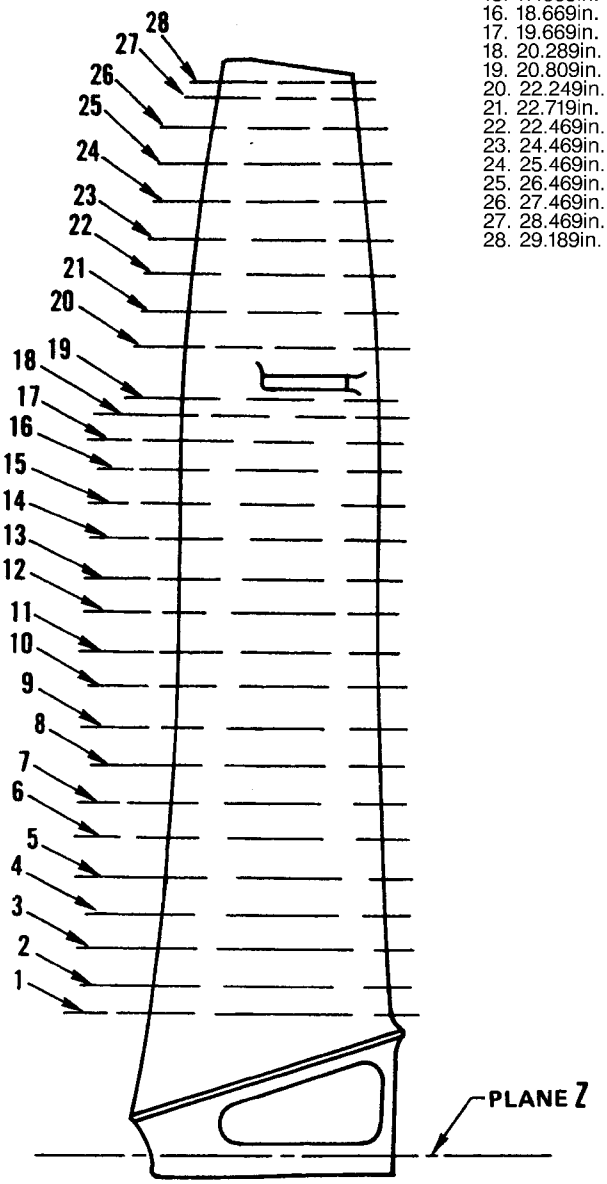


BM5 72 21 02 8 KRMC 00

Leading Edge Contour Repair
(For PN 52A121 and 52A121-001 Blades) (Sheet 2/2)
Figure 809

DIMENSIONS FOR PN 52A121 AND 52A121-001 BLADE

DIMENSION FROM PLANE Z	MINIMUM CHORD DIMENSION
1. 4.009in. (101.829mm)	6.999in. (177.775mm)
2. 4.669in. (118.593mm)	7.013in. (178.130mm)
3. 5.669in. (143.993mm)	7.028in. (178.511mm)
4. 6.669in. (169.393mm)	7.080in. (179.832mm)
5. 7.669in. (194.793mm)	7.159in. (181.839mm)
6. 8.669in. (220.193mm)	7.233in. (183.718mm)
7. 9.669in. (245.593 mm)	7.296in. (185.318mm)
8. 10.669in. (270.993mm)	7.367in. (187.122mm)
9. 11.669in. (296.393mm)	7.455in. (189.357mm)
10. 12.669in. (321.793mm)	7.555in. (191.897mm)
11. 13.669in. (347.193mm)	7.657in. (194.488mm)
12. 14.669in. (372.593mm)	7.746in. (196.748mm)
13. 15.669in. (397.993mm)	7.836in. (199.034mm)
14. 16.669in. (423.393mm)	7.933in. (201.498mm)
15. 17.669in. (448.793mm)	8.028in. (203.911mm)
16. 18.669in. (474.193mm)	8.124in. (206.350mm)
17. 19.669in. (499.593mm)	8.230in. (209.042mm)
18. 20.289in. (515.341mm)	8.297in. (210.744mm)
19. 20.809in. (528.549mm)	8.346in. (211.988mm)
20. 22.249in. (565.125mm)	8.529in. (216.637mm)
21. 22.719in. (577.063mm)	8.599in. (218.415mm)
22. 22.469in. (570.713mm)	8.714in. (221.336mm)
23. 24.469in. (621.513mm)	8.876in. (225.450mm)
24. 25.469in. (646.913mm)	9.048in. (229.819mm)
25. 26.469in. (672.313mm)	9.188in. (233.375mm)
26. 27.469in. (697.713mm)	9.342in. (237.287mm)
27. 28.469in. (723.113mm)	9.503in. (241.376mm)
28. 29.189in. (741.401mm)	9.628in. (244.551mm)



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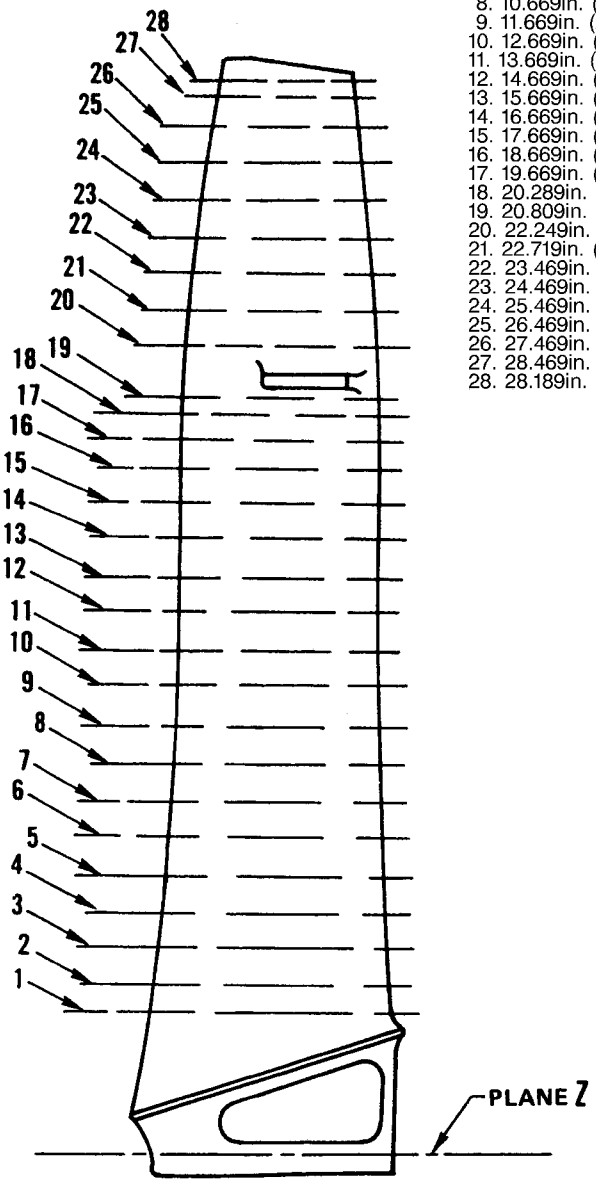
Minimum Fan Blade Chord Length
(For PN 52A121 and 52A121-001 Blades)
Figure 810

DIMENSIONS FOR PN 56A821 AND 53A321-001 BLADES

DIMENSION FROM PLANE Z	MINIMUM CHORD DIMENSION
1. 4.009in. (101.829mm)	6. 900in. (175.260mm)
2. 4.669in. (118.593mm)	6. 914in. (175.616mm)
3. 5.669in. (143.993mm)	6. 929in. (175.997mm)
4. 6.669in. (169.393mm)	6. 979in. (177.267mm)
5. 7.669in. (194.793mm)	7. 057in. (179.248mm)
5. 8.669in. (220.193mm)	7. 131in. (181.127mm)
7. 9.669in. (245.593mm)	7. 194in. (182.728mm)
8. 10.669in. (270.993mm)	7. 267in. (184.582mm)
9. 11.669in. (296.393mm)	7. 351in. (186.715mm)
10. 12.669in. (321.793mm)	7. 446in. (189.128mm)
11. 13.669in. (347.193mm)	7. 549in. (191.745mm)
12. 14.669in. (372.593mm)	7. 643in. (194.132mm)
13. 15.669in. (397.993mm)	7. 735in. (196.469mm)
14. 16.669in. (423.393mm)	7. 831in. (198.907mm)
15. 17.669in. (448.793mm)	7. 928in. (201.371mm)
16. 18.669in. (474.193mm)	8. 025in. (203.835mm)
17. 19.669in. (499.593mm)	8. 128in. (206.451mm)
18. 20.289in. (515.341mm)	8. 195in. (208.153mm)
19. 20.809in. (528.549mm)	8. 242in. (209.347mm)
20. 22.249in. (565.125mm)	8. 430in. (214.122mm)
21. 22.719in. (577.063mm)	8. 496in. (215.798mm)
22. 23.469in. (596.113mm)	8. 583in. (218.008mm)
23. 24.469in. (621.513mm)	8. 746in. (222.148mm)
24. 25.469in. (646.913mm)	8. 920in. (226.568mm)
25. 26.469in. (672.313mm)	9. 060in. (230.124mm)
26. 27.469in. (697.713mm)	9. 164in. (232.766mm)
27. 28.469in. (723.113mm)	9. 326in. (236.880mm)
28. 28.189in. (741.401mm)	9. 451in. (240.055mm)



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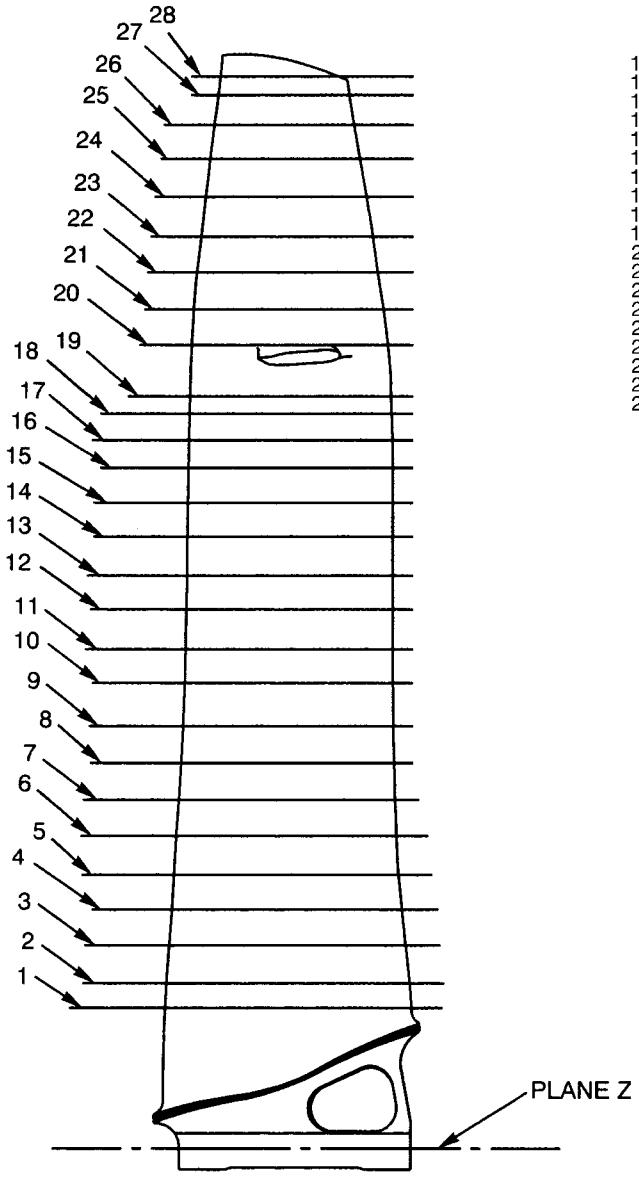
Minimum Fan Blade Chord Length
(PN 56A821 and 53A321-001 Blades)
Figure 811

DIMENSIONS FOR PN 56A621 BLADE

DIMENSION FROM PLANE Z	MINIMUM CHORD DIMENSION
1. 4.009in. (101.829mm)	6.929in. (175.997mm)
2. 4.669in. (118.593mm)	6.966in. (176.936mm)
3. 5.669in. (143.993mm)	7.006in. (177.952mm)
4. 6.669in. (169.393mm)	7.047in. (178.994mm)
5. 7.669in. (194.793mm)	7.108in. (180.543mm)
6. 8.669in. (220.193mm)	7.153in. (181.686mm)
7. 9.669 in. (245.593mm)	7.203in. (182.956mm)
8. 10.669in. (270.993mm)	7.273in. (184.734mm)
9. 11.669in. (296.393mm)	7.358in. (186.893mm)
10. 12.669in. (321.793mm)	7.454in. (189.332mm)
11. 13.669in. (347.193mm)	7.558in. (191.973mm)
12. 14.669in. (372.593mm)	7.654in. (194.412mm)
13. 15.669in. (397.993mm)	7.744in. (196.698mm)
14. 16.669in. (423.393mm)	7.840in. (199.136mm)
15. 17.669in. (448.793mm)	7.993in. (201.498mm)
16. 18.669in. (474.193mm)	8.032in. (204.013mm)
17. 19.669in. (499.593mm)	8.134in. (206.604mm)
18. 20.603in. (523.316mm)	8.236in. (209.194mm)
19. 21.169in. (537.693mm)	8.300in. (210.820mm)
20. 21.953in. (557.606mm)	(NONE, MIDSPAN SHROUD)
21. 22.653in. (575.386mm)	8.490in. (2156468mm)
22. 23.469in. (596.113mm)	8.606in. (218.592mm)
23. 24.469in. (621.513mm)	8.750in. (222.250mm)
24. 25.469in. (646.913mm)	8.931in. (226.847mm)
25. 26.469in. (672.313mm)	9.070in. (230.378mm)
26. 27.469in. (697.713mm)	9.220in. (234.188mm)
27. 28.469in. (723.113mm)	9.342in. (237.287mm)
28. 29.189in. (741.401mm)	9.461in. (240.309mm)



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PW V

Minimum Fan Blade Chord Length
(PN 56A621 Blade)
Figure 812

FAN EXIT FAIRING - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A. PWA85685	Puller, Knocher
B. Material No.P03-001	Oils (Ref. 70-00-00)
C.	Torque Wrench
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 72-21-02, P. Block 401	Stage 1 LPC (Fan) Blades

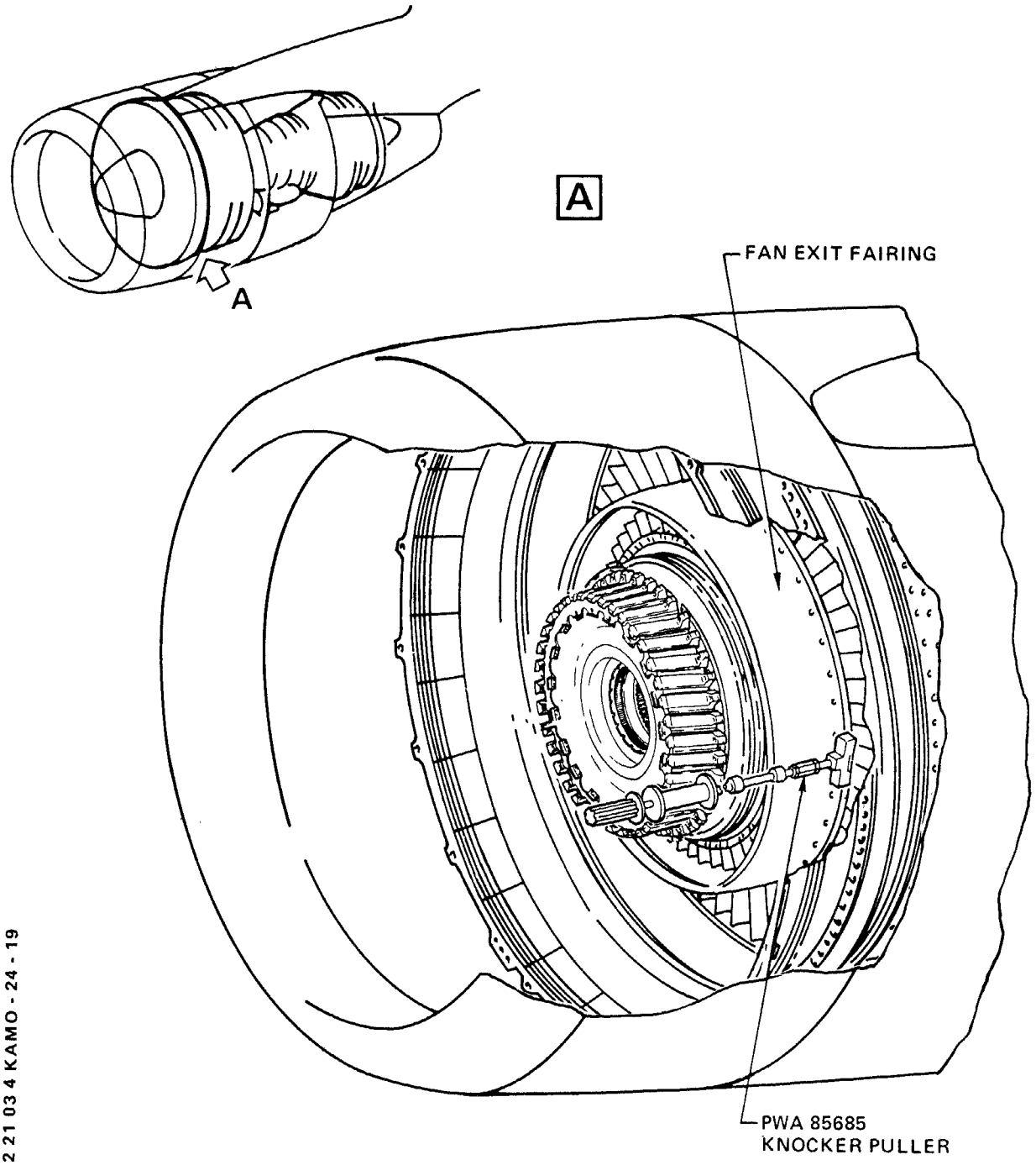
2. Procedure

A. Job Set-Up
(1)Remove all Stage 1 LPC (Fan) Blades (Ref. 72-21-02, P. Block 401).

B. Removal (Ref. Fig. 401)
(1)Install suitable protector on ID of fan case at 6 o'clock position to protect rubstrip.
(2)Remove (36) screws securing fan exit fairing splitter. Position PWA85685 Knocher Puller, small tooth side, in one of nine slots on rear OD of fairing. Remove fairing until able to use opposite side of puller jaw to complete removal of fairing.

C. Installation (Ref. Fig. 401)
(1)Install fairing (splitter) over Stage 1 LPC stator OD engaging front lip of fairing with front flange of stator and aligning holes in fairing with holes in fan exit case and vane assembly inner front flange. Secure fairing with screws threads lubricated with Material No.P03-001. TORQUE screws to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).
(2)Remove protector from ID of fan case.

D. Close-Up
(1)Install all Stage 1 LPC (fan) Blades (Ref. 72-21-02, P. Block 401).
(2)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).



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Fan Exit Fairing
Figure 401

FAN EXIT FAIRING - INSPECTION/CHECK

1. Inspect Fan Exit Fairing (Ref. Fig. 601)

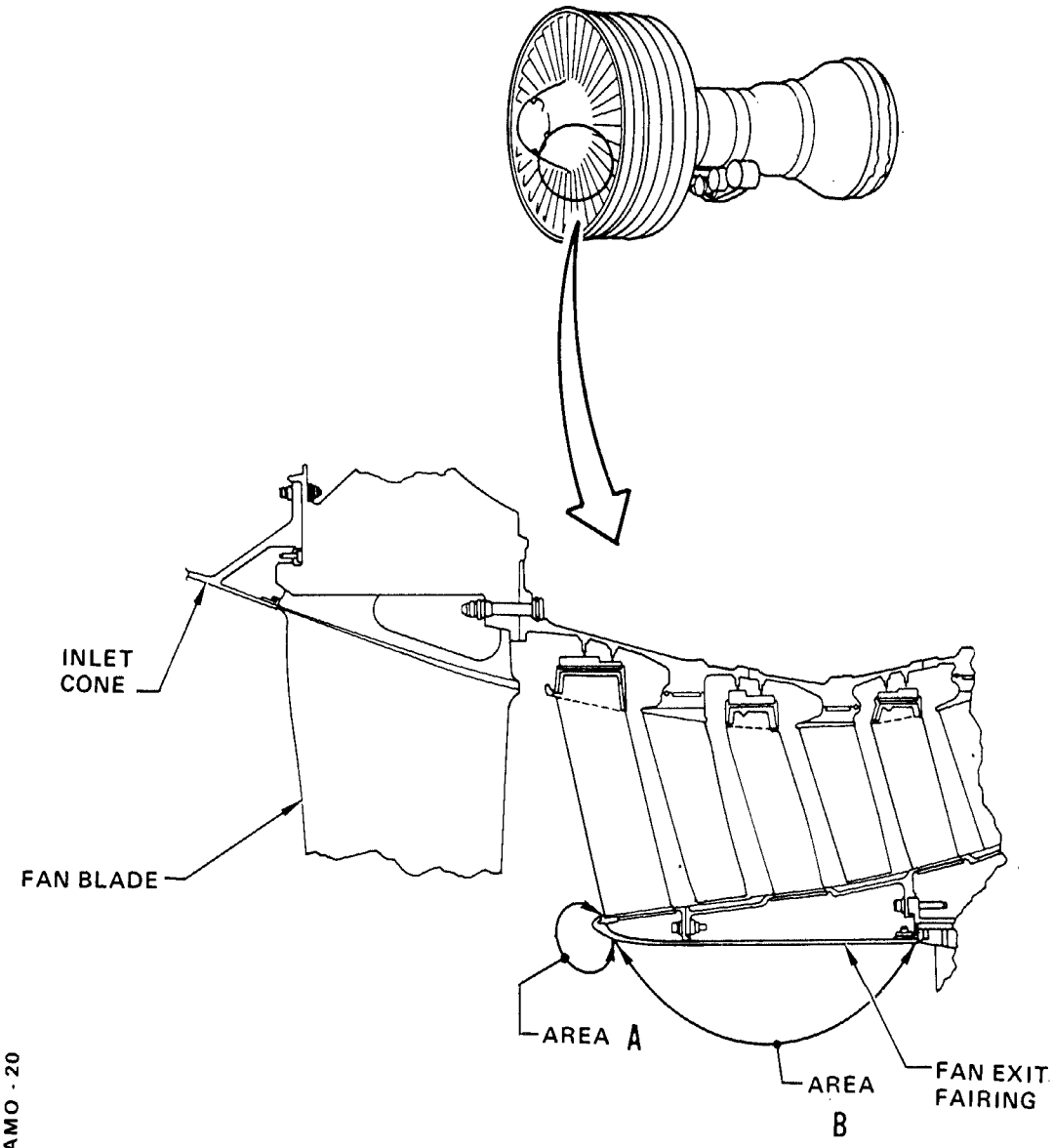
   A. Nicks, gouges and cracks in leading edge (Area A) of fairing more than 0.050 in. (1.270 mm) deep are not acceptable. Nicks, gouges and cracks in leading edge less than 0.050 in. (1.270 mm) deep and less than 0.500 in. (12.700 mm) wide, located at least 2 in. (50.800 mm) apart and numbering no more than 3 in a 45 degree arc are acceptable without repair.

   B. Nicks and gouges in fairing surface (Area B) up to 1.000 in. (25.400 mm) diameter, up to 0.050 in. (1.270 mm) deep, located at least 2 in. (50.800 mm) apart and numbering no more than 5 in a 45 degree arc are acceptable without repair.

   C. Delamination (composite material) in Area A and B up to 1.000 in. (25.400 mm) by 1.500 in. (38.100 mm) and up to 0.050 in. (1.270 mm) deep located at least 2 in. (50.800 mm) from any other delamination, nick or gouge, numbering no more than 5 including other delamination, nicks or gouges, in a 45 degree arc may be continued-in-service until convenient to remove.

   D. Delamination (composite material) must be visually inspected every 50 hours for growth. Exceeding above limits shall be cause for removal within 25 hours. If delamination exceeds 2.500 in. (63.500 mm) by 2.000 in. (50.800 mm) this shall be cause for immediate removal.

   E. Delamination, erosion or peeling of the black polyurethane protective coating is permitted up to 100% on surfaces A and B, (Ref. Fig. 601), and the part can continue in use. The part can be repaired at subsequent maintenance requirements.
      NOTE : Fan Exit Fairing Assemblies that incorporated a steel leading edge cap will be without the black polyurethane surface layer. Visually inspect the steel leading edge cap to make certain it is correctly attached.



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Fan Exit Fairing Inspection
Figure 601

STAGE 1.6 LPC BLADE - INSPECTION/CHECK

1. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - Standard Practices
- 72-21-05, P. Block 801	Stage 1.6 LPC - Blade

2. Procedure

A. Inspection Limits (Ref. Fig. 601)

NOTE : Inpection of stage 1.6 LPC blades is only necessary if inspection of stage 1 LPC stator shows damage. Stage 1 LPC blades and stage 1 LPC stator must be removed before doing stage 1.6 blade inspection.

(1)Stage 1.6 LPC blade damage can be blend repaired (Ref. 72-21-05, P. Block 801) if damage is not more than the subsequent limits for areas (Ref. Fig. 601)

(a)Area A : Damage confined to an area outside of 0.37 in. (9.52 mm) radius maximum.
(b)Area B : Damage to depth not more than 25% of local thickness.
(c)Area C : 0.12 in. (3.17 mm) maximum depth.
(d)Area D : No damage allowed.
(e)Area E : 0.03 in. (0.81 mm) maximum depth.

B. Blend Limits

NOTE : Compressor blade blend limits are evaluated from standpoint of structural integrity only. Use of subtantial number of blades reworked at or near maximum limits or blades having reworked areas may adversely affect compressor efficiency and engine performance.

(1)Perform fluorescent penetrant inspection of blade for cracks per SPOP 70. Use ultra high sensitivity penetrant (Ref. 70-00-00, P. Block 201). Cracks shall be cause for rejection.

(2)Damaged blades may be repaired by local blending per limits specified in figure (Ref. Fig. 601). Additional requirements are as follows :

(a)Length of blend must be four times the depth.
(b)Blends on leading and trailing edges must not be directly opposite and must be seperated diagonally by a minimum distance equal to the mean chordal length of the blade.
(c)Maximum of two edge blends to maximum depth limit allowed per blade edge.
(d)No restriction on number of edge blends which are up to one-half maximum depth limit provided three-fourths of each edge is unblended.
(e)Total length of tip blend must not exceed one-fourth of total tip length.
(f)On smooth, round bottom indentation, remove edge of damage only. Blend in area "B" to be no greater than 10 percent of airfoil surface.
(g)Nicks on leading and trailing edges become more critical as they

become closer to the blade root. Any damage on the inner half of airfoil should be repaired with caution.

(3)Blades exhibiting rough indentations (blade material compressed and edges raised) and defects with small radii or ragged edges must be removed.

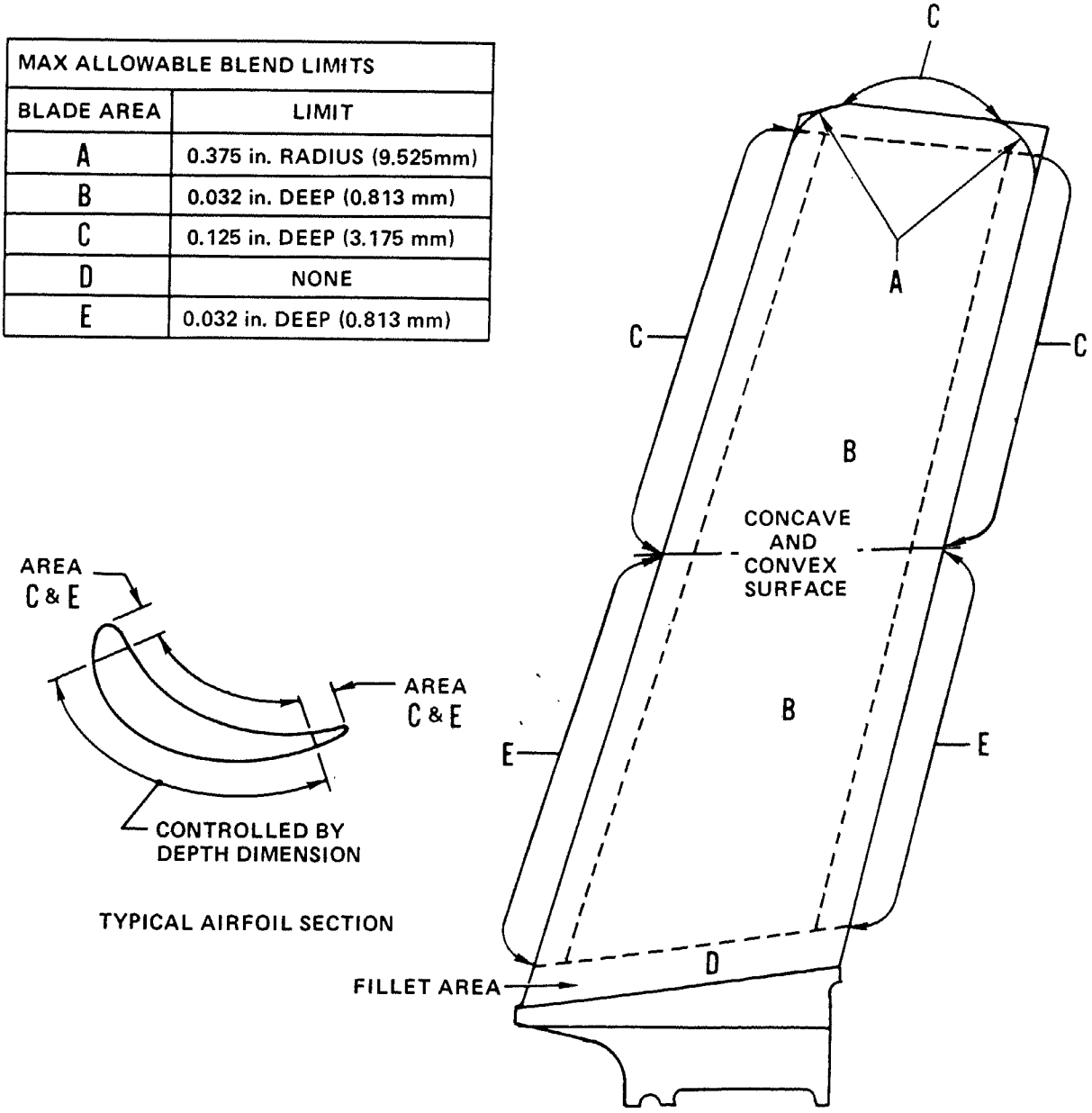
(4)Round defects at leading and trailing edges which can be seen on both convex and concave sides of blade are acceptable without repair provided defect is in outer half of blade and identation does not exceed 0.010 in. (0.254 mm).

(5)Any defect on inner half of blade should be considered for repair only after careful inspection.

NOTE : Nicks in leading and trailing edges become increasingly critical with proximity to blade root.

(6)Blend reparable blades (Ref. 72-21-05, P. Block 801).

MAX ALLOWABLE BLEND LIMITS	
BLADE AREA	LIMIT
A	0.375 in. RADIUS (9.525mm)
B	0.032 in. DEEP (0.813 mm)
C	0.125 in. DEEP (3.175 mm)
D	NONE
E	0.032 in. DEEP (0.813 mm)



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Stage 1.6 LPC Blade Blend Limits
Figure 601

STAGE 1.6 LPC BLADE - APPROVED/REPAIRS

1. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedure - 70-00-00, P. Block 201	Engine - Standard Practices

2. Blend Repair Stage 1.6 LPC Blade

A. Procedure (Ref. Fig. 801)

(1) Damaged blades may be repaired by local blending using files and fine stones and finish using fine stones per limits specified in (Ref. Fig. 801). Additional requirements are as follows :

(a) Length of blend must be four times the depth.

(b) Blends on leading and trailing edges must not be directly opposite and must be separated diagonally by a minimum distance equal to the mean chordal length of the blade.

(c) Maximum of two edge blends to maximum depth limit allowed per blade edge.

(d) No restriction on number of edge blends which are up to one-half maximum depth limit provided three-fourths of each edge is unblended.

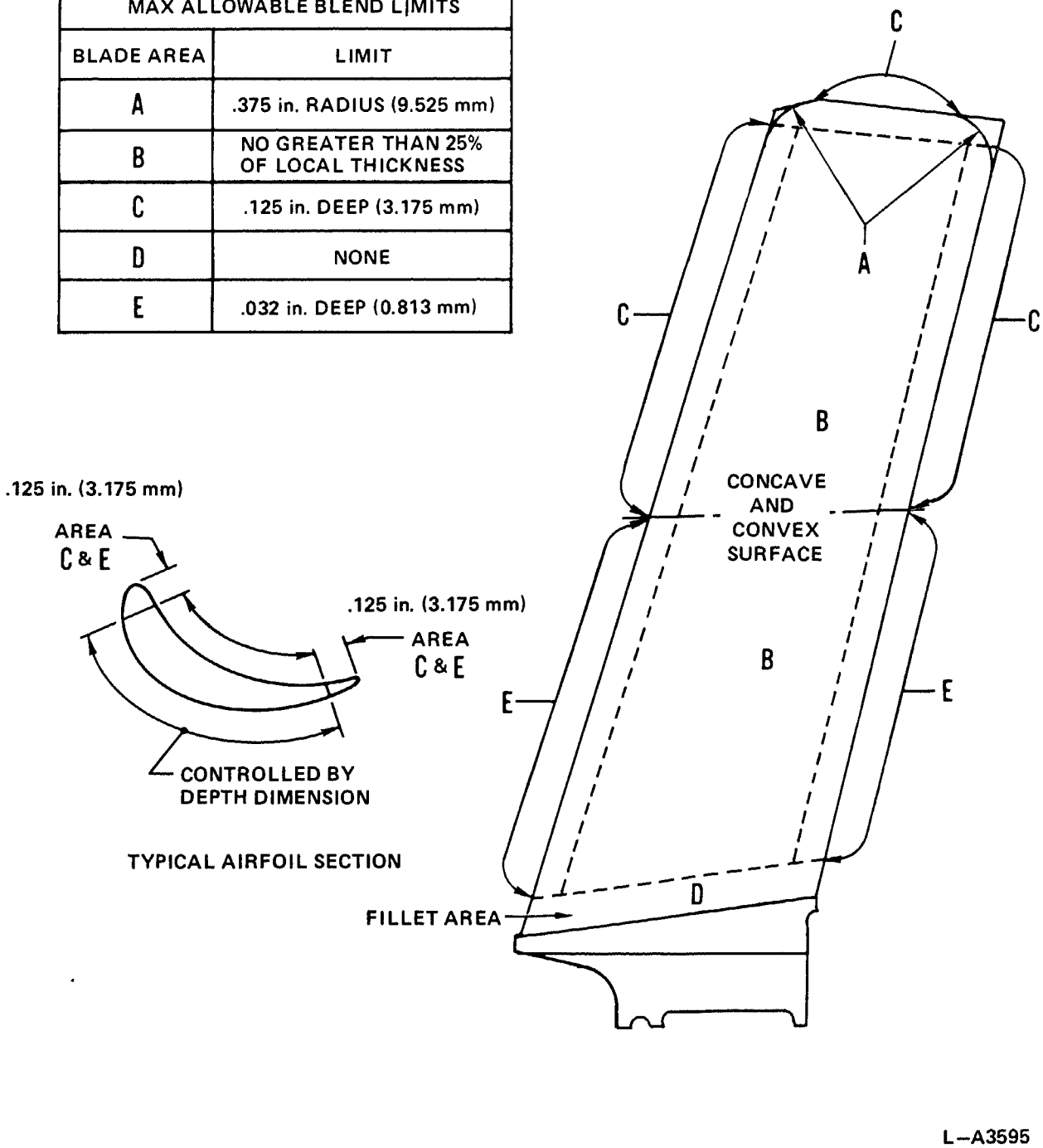
(e) Total length of tip blend must not exceed one-fourth of total tip length.

(f) On smooth, round bottom indentation, remove edge of damage only. Blend in area "B" to be no greater than 10 percent of airfoil surface.

(g) Nicks on leading and trailing edges become more critical as they become closer to the blade root. Any damage on the inner half of airfoil should be repaired with caution.

(2) Fluorescent penetrant inspect repaired blades per SPOP70. Use ultra high sensitivity penetrant (Ref. 70-00-00, P. Block 201). Any crack is cause for rejection.

MAX ALLOWABLE BLEND LIMITS	
BLADE AREA	LIMIT
A	.375 in. RADIUS (9.525 mm)
B	NO GREATER THAN 25% OF LOCAL THICKNESS
C	.125 in. DEEP (3.175 mm)
D	NONE
E	.032 in. DEEP (0.813 mm)



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Stage 1.6 LPC Blade Blend Limits
Figure 801

STAGE 1.6 LPC STATOR RUBSTRIP - INSPECTION/CHECK

1. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedure - 72-21-05, P. Block 601	Stage 1.6 LPC Blade

2. Procedure

A. Inspection Limits (Ref. Table 601) (Ref. Fig. 601)

NOTE : Inspection of the Stage 1.6 LPC stator rubstrip is only necessary if inspection of the Stage 1.6 LPC blades (Ref. 72-21-05, P. Block 601) shows there is rubstrip wear or erosion.

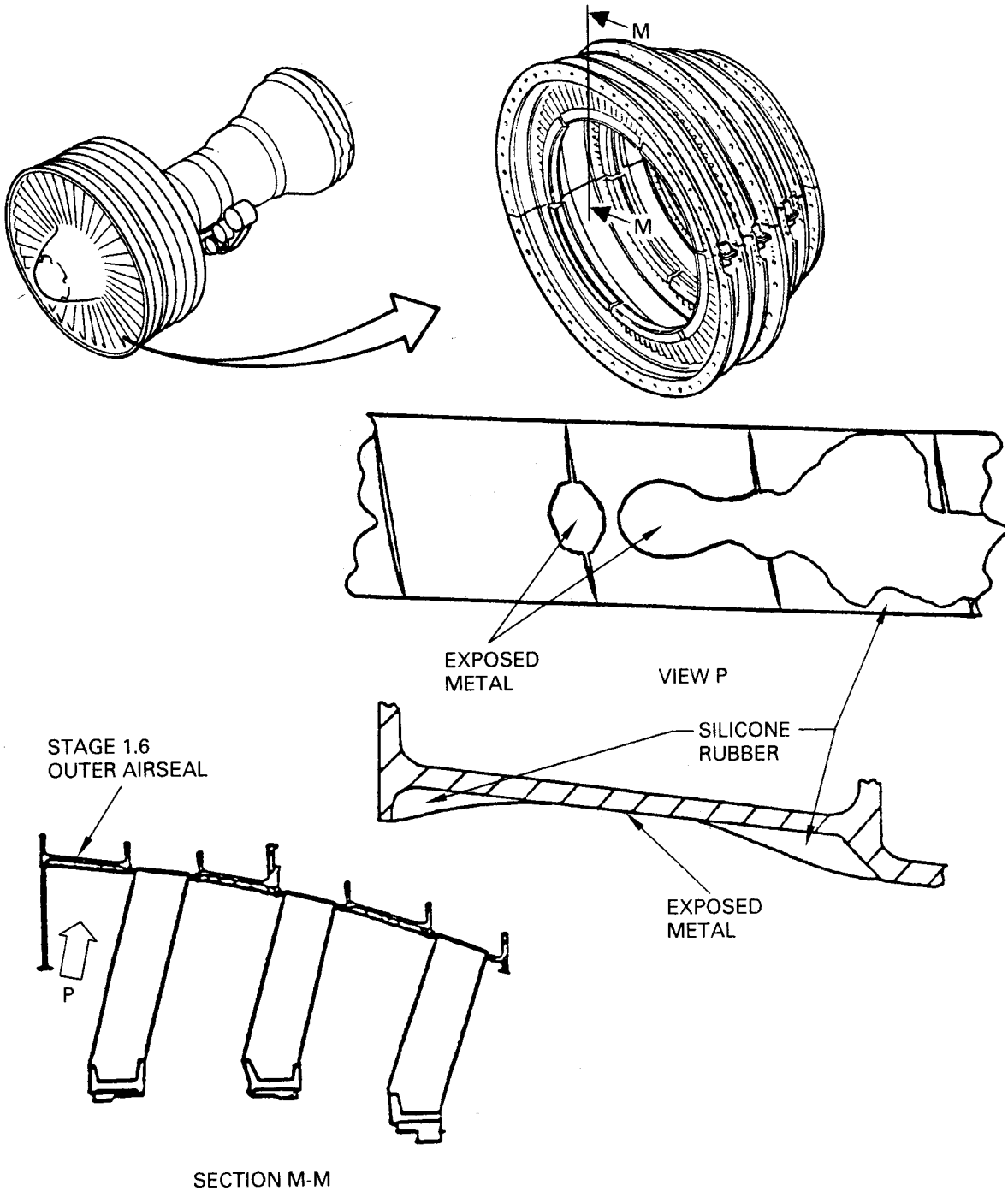
(1)Stage 1.6 LPC stator rubstrip damage, other than from wear or erosion, which is in excess of the limits given should be removed for repair within 50 hours.

INSPECT	SERVICEABLE LIMITS
Blade Wake Erosion	Exposed Metal All Locations
Vane Rub/ Erosion	Exposed Metal 360 Degrees
Other Damage	
Scratches or Wear through the Rubstrip that Damages the Metal	Not Permitted

Stage 1.6 LPC Stator Rubstrip Continue-In-Service Limits
Table 601

NOTE : Continued operation with worn or eroded LPC 1.6 stage rubstrips can result in a TSFC debit as high as 0.6 percent and an increase in EGT of 7 degrees C.

NOTE : The above continue-in-service limits should be applied to engines that have had no recent operational discrepancies affecting EGT margin.



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1.6 LPC Stator Rubstrip Inspection
Figure 601

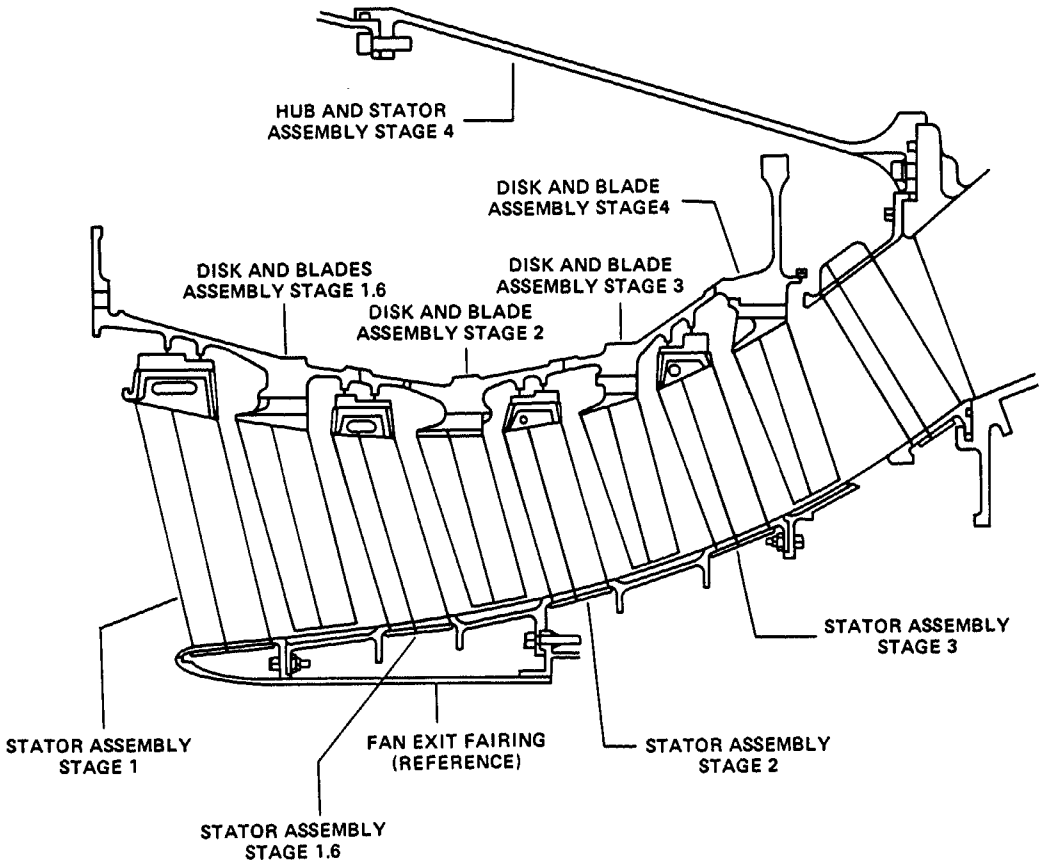
LPC STATOR ASSEMBLY - DESCRIPTION AND OPERATION

1. Description (Ref. Fig. 001, 002)

A. The stator consists of 1st, 1.6, 2nd and 3rd stage vanes and shrouds. Vanes are designed to resist torque loads transmitted by aerodynamic forces along vanes and to absorb bending moments caused by pressure differentials across the vanes.

B. The LPC stator assembly consists of a single stage (Stage 1 compressor stator assembly) full hoop aluminum case with titanium stator vanes mechanically attached to a three stage (Stages 1.6, 2 and 3 compressor stator assembly) split case aluminum stator assembly with titanium vanes installed in all three stages. The Stage 1 stator consists of 88 solid vanes and is located immediately aft of the Stage 1 LPC blades at the entrance to the primary gaspath. At the inner shroud of the Stage 1 stator are a pair of PWA 407 abradable seal lands axially aligned with a pair of knife-edge seals on the drum rotor. The three stage (Stages 1.6, 2 and 3) stator assembly also contains solid vanes and incorporates three PWA 407 abradable rubstrips at outer shroud locations in axial alignment with blades (Stages 1.6, 2 and 3). At inner shroud locations are three pairs of PWA 407 abradable seal lands in axial alignment with pairs of knife-edge seals on the drum rotor. An aluminum LPC stage duct which incorporates a PWA 407 abradable rubstrip in axial alignment with the Stage 4 LPC blades is mechanically attached to the rear outer flange of the LPC compressor stator.

C. The LPC compressor stator assembly is supported structurally by mechanical attachment to the fan exit inner case.


HUB AND STATOR ASSEMBLY STAGE 4
DISK AND BLADE ASSEMBLY STAGE4
DISK AND BLADES ASSEMBLY STAGE 1.6
DISK AND BLADE ASSEMBLY STAGE 3
DISK AND BLADE ASSEMBLY STAGE 2
STATOR ASSEMBLY STAGE 3
STATOR ASSEMBLY STAGE 1
FAN EXIT FAIRING (REFERENCE)
STATOR ASSEMBLY STAGE 2
STATOR ASSEMBLY STAGE 1.6

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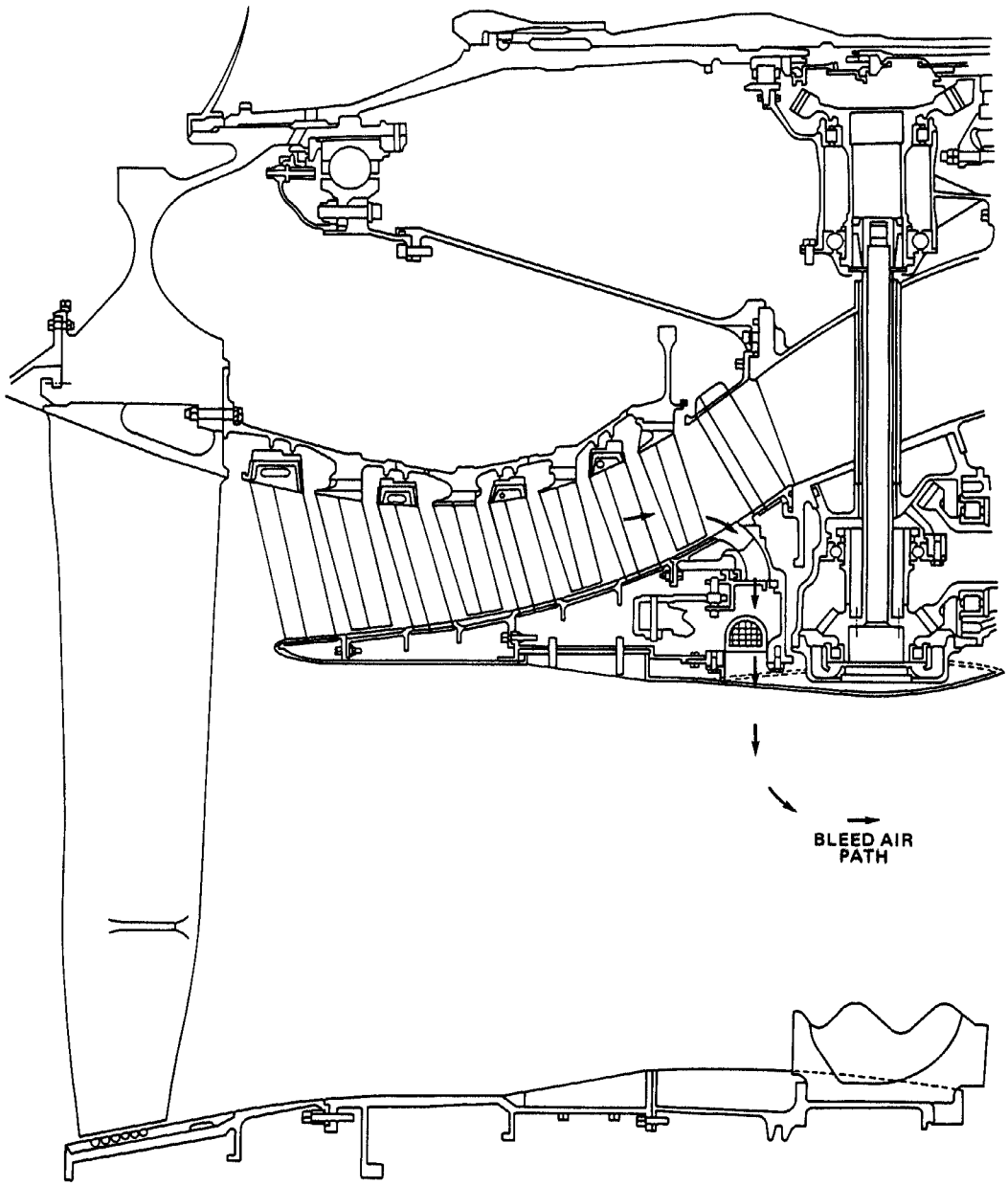
Front Compressor Stator Group
Figure 001



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Fan/Low Pressure Compressor
Figure 002

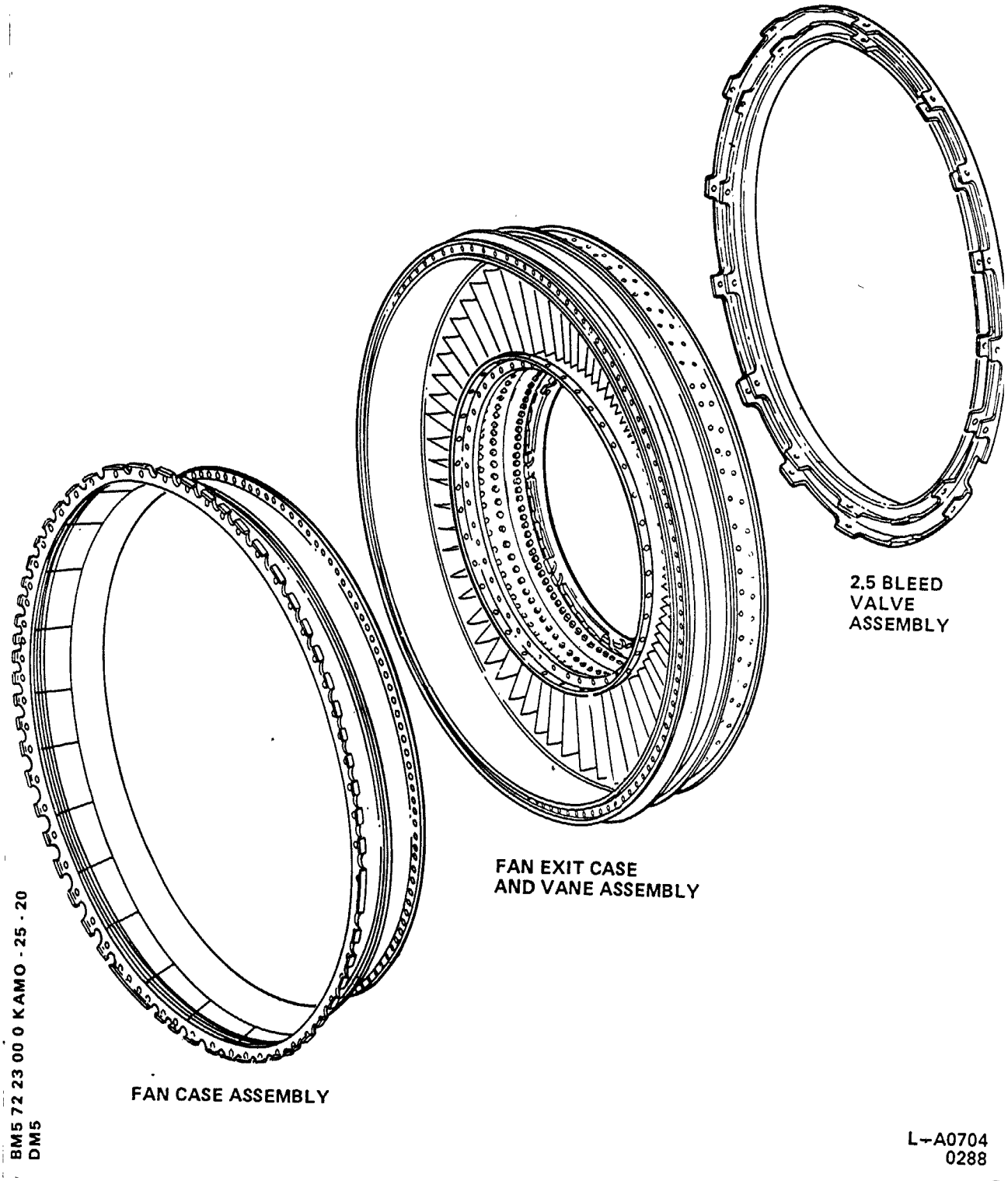
FAN FRAME ASSEMBLY - DESCRIPTION AND OPERATION

1. Fan Cases (Ref. Fig. 001, 002)
Between the nose cowl and the airframe supplied fan exhaust hardware are three separate fan cases whose purpose is to contain and direct the fan discharge airstream and to provide the structural link between the airframe and the core engine. They are the fan case assembly, the fan exit case and vane assembly, and the fan exit rear case. The fan case assembly and the fan exit case and vane assembly, including the 2.5 bleed valve and linkage, comprise the fan cases and are addressed here. The fan exit rear case is integral to the intermediate case and is addressed in the intermediate case section.

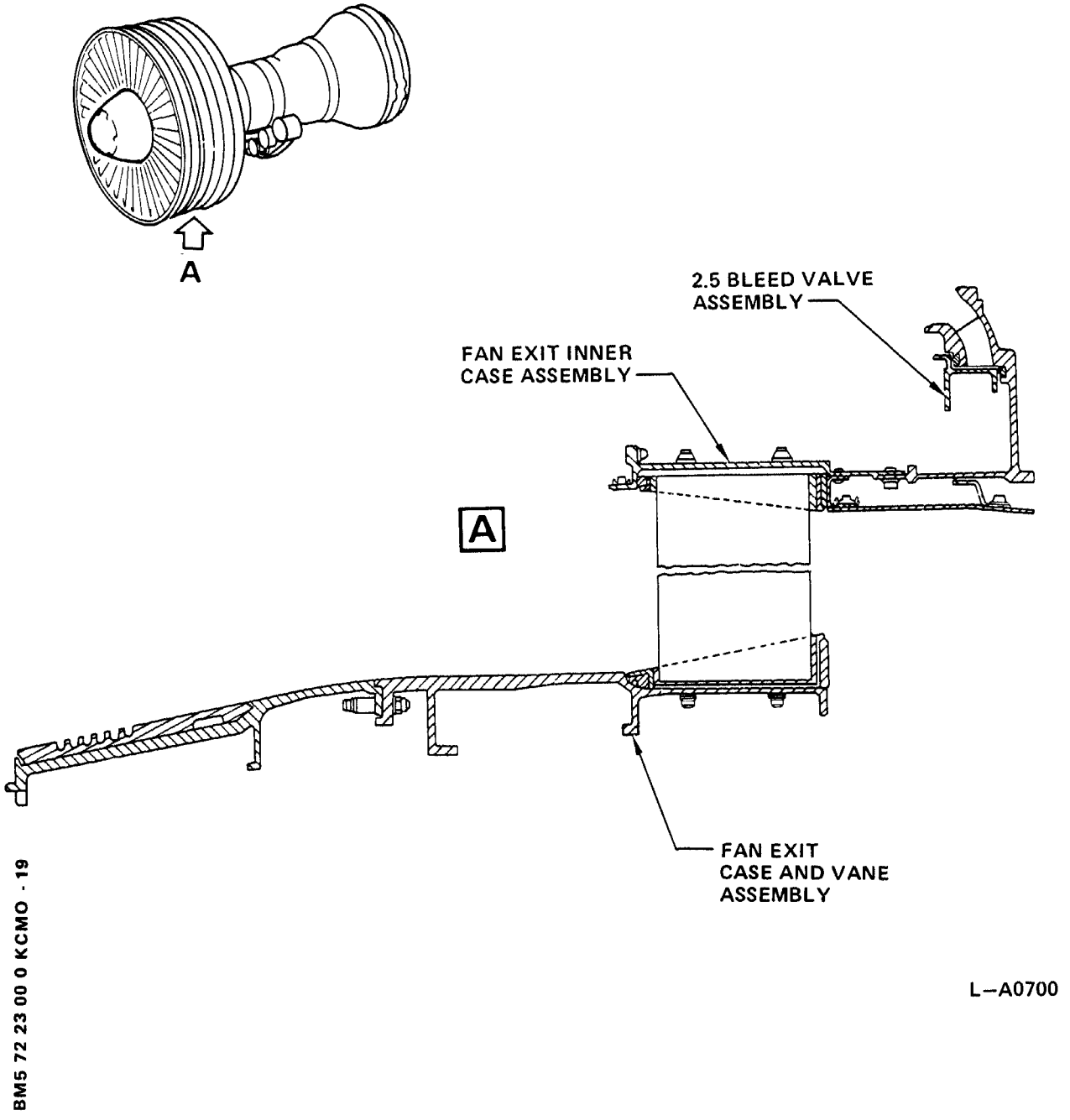
2. Fan Case Assembly
The strengthened stainless steel fan case assembly supports the nose cowl and provides for containment of the fan blades. Abradable fan blade rubstrip segments, which are made by an injection molding process that requires no finish machining, are secured to the ID of the fan case assembly with adhesive and mechanical retention. The fan case assembly is supported by mechanical attachment to the outer fan exit case.

3. Fan Exit Case and Vane Assembly
The fan exit case and vane assembly consists of an aluminum outer case, an aluminum inner case assembly and eighty four fan exit vanes that span the two cases. At the front the outer case supports the fan case assembly while at the rear the outer case itself is supported by mechanical attachment to the fan exit rear case. The inner case assembly supports the LPC stator assembly at the front while itself being supported at the rear by mechanical attachment to the intermediate case. The fan exit vanes are made of a composite material.

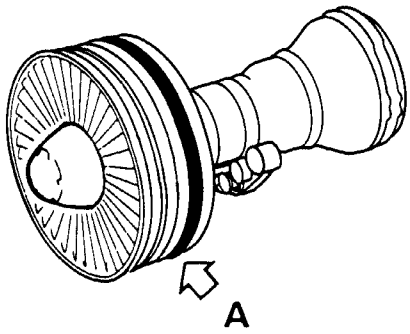
4. Intermediate Case (Ref. Fig. 003, 004)
The intermediate case is a major structural member of the engine that supports the thrust bearings for both the LPC and HPC rotors. The No. 1 ball bearing is supported by a cone support attached to the inner front flange of the compressor intermediate case. The No. 2 ball bearing is supported by the inner rear flange of the compressor intermediate case.
Two mount brackets located on the rear of the compressor intermediate case transmit the thrust generated by both rotors directly by the airframe structure. A puck arrangement on the upper rear face of the compressor intermediate case provides for an airframe structure connection to carry engine vertical and side loads.
In addition to the compressor intermediate case assembly, the intermediate case group consists of the 4th stage compressor stator, the angle gearbox and the bevel gear, gearshaft and driveshaft assembly which transmit power from the HPC rotor are designed to straighten the fan discharge airstream prior to the air entering the airframe supply for exhaust hardware.

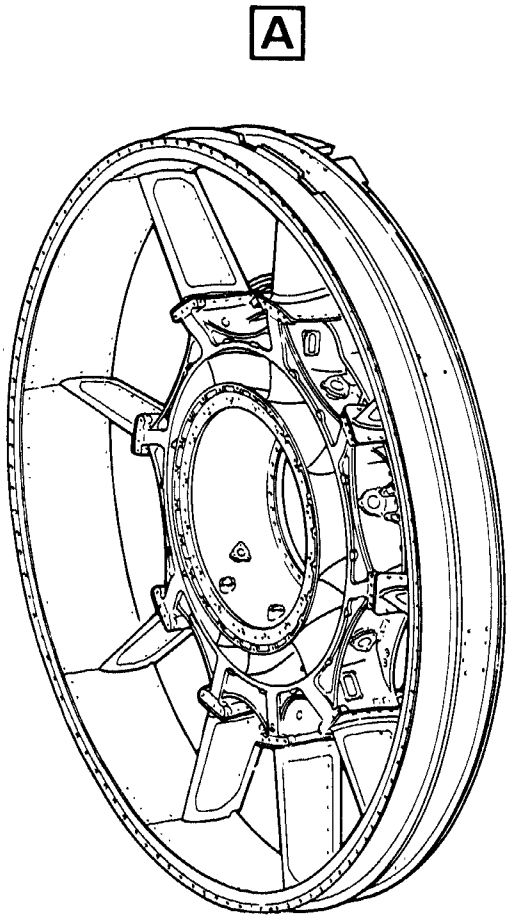


Fan Case
Figure 001



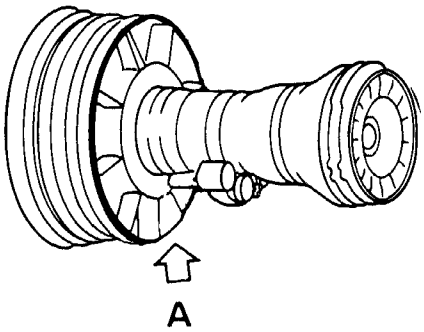
Fan Case Section
Figure 002

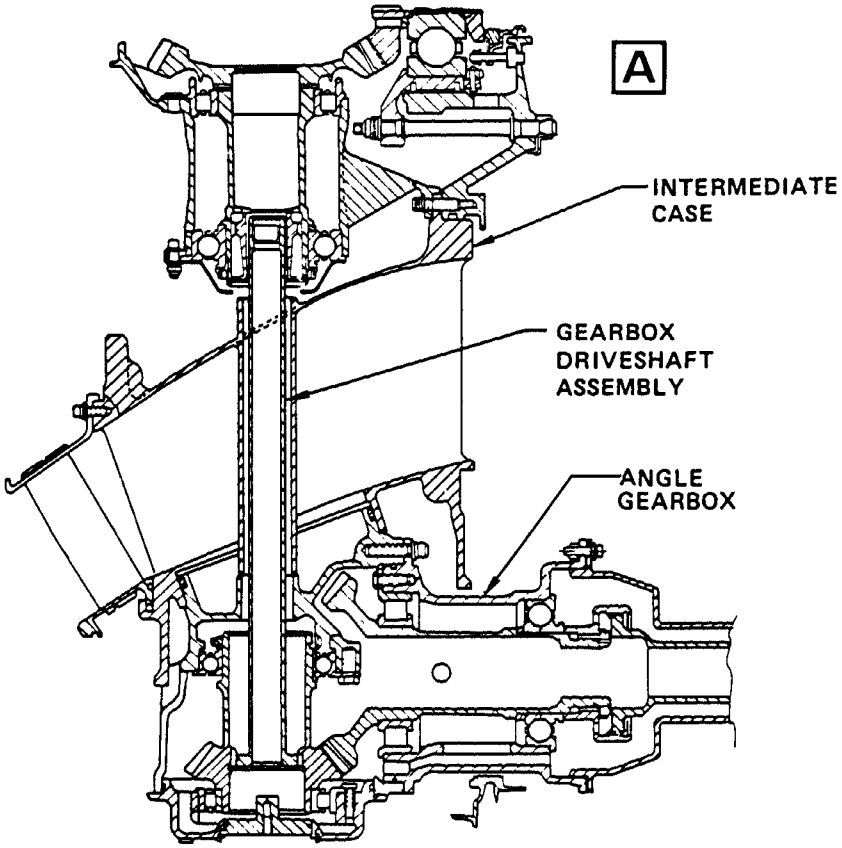




BM5 72 23 00 0 KEMO - 19

Intermediate Case
Figure 003





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Intermediate Case Section
Figure 004

FRONT FAN CASE ASSEMBLY - REMOVAL/INSTALLATION

1. Procedures (Configuration 1)

A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. PWA85677	Bracket Handling
C. Material No.P03-001	Oils (Ref. 70-00-00)
D. Material No.P05-289	Special Materials (Ref. 70-00-00)
E. Material No.P05-291	Special Materials (Ref. 70-00-00)
F. Material No.P05-292	Special Materials (Ref. 70-00-00)
G.	Torque Wrench
H.	Bergen Mechanical Crimper (optional) Model M303, M305 or M307
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 73-21-01, P. Block 401	Full Authority Digital Engine Control Unit (FADEC)
- 72-21-02, P. Block 401	First Stage Compressor Rotor (Fan) Blades Assembly

B. Job Set-Up
(1)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove first stage compressor rotor (fan) blades assembly (Ref. 72-21-02, P. Block 401).
(3)Remove FADEC (Ref. 73-21-01, P. Block 401).

C. Removal (Ref. Fig. 401, 406, 403)
(Ref. Fig. 402, 404, 405)
(1)Remove PT2 and PAM tube assemblies.
(a)Remove lockwire and disconnect tube nuts from adapters at approximately 12 o'clock position on Flange A1 bracket. Remove lockwire and disconnect tube nuts from tube couplings rearward of Flange B1 at approximately 11 o'clock position.
(b)Remove bolts, nuts, and clamps securing tubes to Flange B and Flange B1 brackets between 11 o'clock and 12 o'clock positions. Remove tubes from engine.
(c)Install protective closures.
(2)Remove PT4.95 and PB flex hose assemblies.
(a)Disconnect hose nuts from manifold tees at approximately 9 o'clock position.
(b)Remove bolt, nut, and clamps securing hoses to Flange B bracket at approximately 9 o'clock position and remove hoses from engine.
(c)Install protective closures.
(3)Remove PT4.95 and PB manifold assemblies.
(a)Remove lockwire and disconnect tube nuts from manifold couplings

rearward of Flange B1 at approximately 11 o'clock position.
(b)Remove bolts, nuts, and clamps securing manifolds to flange B and flange B1 brackets between 9 o'clock and 10 o'clock positions. Remove manifolds from engine.
(c)Install protective closures.
CAUTION : AVOID TWISTING OR SEVERE BENDING OF ELECTRICAL HARNESS AT ANYTIME DURING REMOVAL OR DAMAGE TO HARNESS MAY RESULT.
(4)Remove bolts, nuts, and clamps securing FADEC electrical harness to flange A1 bracket at approximately 9 o'clock position. Secure harness rearward of flange B temporarily.
(5)Remove bolt, nut and clamp securing FADEC electrical harness to flange A1 bracket at approximately 1 o'clock position. Secure harness rearward of flange B temporarily.
(6)Install PWA85677 handling Bracket to front flange of front fan case at 12 o'clock position and secure. Attach hoist.
(7)Remove nuts, washers, spacers bolts and brackets from rear flange (Flange B) of front fan case.
(8)Using fiber mallet, gently tap fan case to loosen flange.
(9)Remove front fan case from engine and place on pallet with rear flange down. Remove hoist and bracket from case.
(10)If new case is to be installed comply with the following :
(a)Remove brackets from Flange A1.
(b)Remove bolt, nut, washer, and FADEC ground cable attached to front of flange A1 at bolthole 100.
(c)Remove bolt, nut, two washers, and FADEC data entry plug attached to front of flange A1 at bolthole 99.
(d)If equipped, remove vibration pick-up bracket from Flange A at approximately 1 o'clock position.

D. Installation (Ref. Fig. 401, 406, 403)
(Ref. Fig. 402, 404, 405)
(1)If new case is to be installed, comply with the following :
(a)Install bracket to Flange A1 and secure with bolts, heads rearward, threads lubricated with Engine Oil (Material No.P03-001), and nuts. TORQUE nuts to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).
(b)Install FADEC data entry plug lanyard to front of Flange A1 at bolthole 99 with bolt, threads lubricated with Engine Oil (Material No.P03-001), washers, and nut. TORQUE bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(c)Install bolt threads lubricated with Engine Oil (Material No.P03-001), washer and nut to secure FADEC ground strap to front of flange A1 at bolthole 100.
TORQUE bolt to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).
(d)If equipped position vibration pickup bracket to rear of Flange A at approximately the 1 o'clock position and secure with bolts threads lubricated with Engine Oil (Material No.P03-001). TORQUE bolts to between 65 and 85 lbf.in. (0.74 and 0.96 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the bolts.
(2)Install PWA85677 handling Bracket to front flange of front fan case at 12 o'clock position and secure Attach hoist. Lift case from pallet and

position front fan case to case and vane assembly aligning dowel pin in front fan case with dowel pin hole in case and vane assembly. Tap front fan case with fiber mallet to seat.

(3)Install bolts, threads lubricated with Engine Oil (Material No.P03-001), spacers, washers, brackets, and nuts to Flange B. TORQUE nuts to between
R 180 and 200 lbf.in. (2.03 and 2.26 m.daN).

(4)Check gap between cases at ID of Flange B to be within 0.000 - 0.020 in. (0.000 - 0.508 mm).

(5)Remove PWA85677 Handling Bracket from front flange of front fan case.

CAUTION : USE OF LUBRICANTS ON FADEC SENSING TUBES, ADAPTERS, OR PACKINGS COULD RESULT IN CONTAMINATION OF FADEC.

(6)Install PT4.95 and PB manifold assemblies.

(a)Remove protective closures and install manifolds to tube nuts at approximately 11 o'clock position rearward of Flange B1 handtight only.

(b)Install clamps, bolts, threads lubricated with Engine Oil (Material No.P03-001), and nuts securing manifolds to Flange B and Flange B1 brackets between 9 o'clock and 10 o'clock positions. TORQUE all clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(c)TORQUE tube nuts to manifold couplings rearward of Flange B1 to between 270 and 300 lbf.in. (3.06 and 3.38 m.daN) and secure with Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).

(7)Install PT4.95 and PB hose assemblies.

(a)Install hoses to manifold tees handtight only.

(b)Install clamps, bolt, threads lubricated with Engine Oil (Material No.P03-001), and nut securing hoses to Flange B bracket at approximately 9 o'clock position. TORQUE clamp bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(c)TORQUE (larger) PT4.95 hose nut to between 450 and 500 lbf.in. (5.09 and 5.64 m.daN).

(d)TORQUE (smaller) PB hose nut to between 270 and 300 lbf.in (3.06 and 3.38 m.daN).

(8)Install PT2 and PAM tube assemblies.

(a)Remove protective closures and install tubes to adapters on Flange A1 bracket at approximately 12 o'clock position and to tube couplings at approximately 11 o'clock position handtight only.

(b)Install bolts, threads lubricated with Engine Oil (Material No.P03-001), nuts, and clamps securing tubes to Flange B and Flange B1 between 12 o'clock and 11 o'clock positions. TORQUE all clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(c)TORQUE (larger) PAM tube nuts to between 270 and 300 lbf.in. (3.06 and 3.38 m.daN). Secure with Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).

(d)TORQUE (smaller) PT2 tube nuts to between 135 and 150 lbf.in. (1.53 and 1.69 m.daN). Secure with Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).

(9)Install clamp, bolt, threads lubricated with Engine Oil (Material No.P03-001), and nut securing FADEC electrical harness to Flange A1 bracket at approximately 9 o'clock position.

TORQUE clamp bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(10)Install clamp, bolt, threads lubricated with Engine Oil (Material No.P03-001), and nut securing FADEC electrical harness to Flange A1 bracket at approximately 1 o'clock position.
TORQUE clamp bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

E. Close-Up

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Install FADEC (Ref. 73-21-01, P. Block 401).
(3)Install first stage compressor rotor (fan) blades assembly (Ref. 72-21-02, P. Block 401).
(4)Close thrust reverser and fan cowl doors, remove safety clips and tag and close circuit breakers (Ref. 71-13-00, P. Block 301).
(5)Test engine per test reference table (Ref. 71-00-00, P. Block 501).

2. Procedures (Configuration 2)

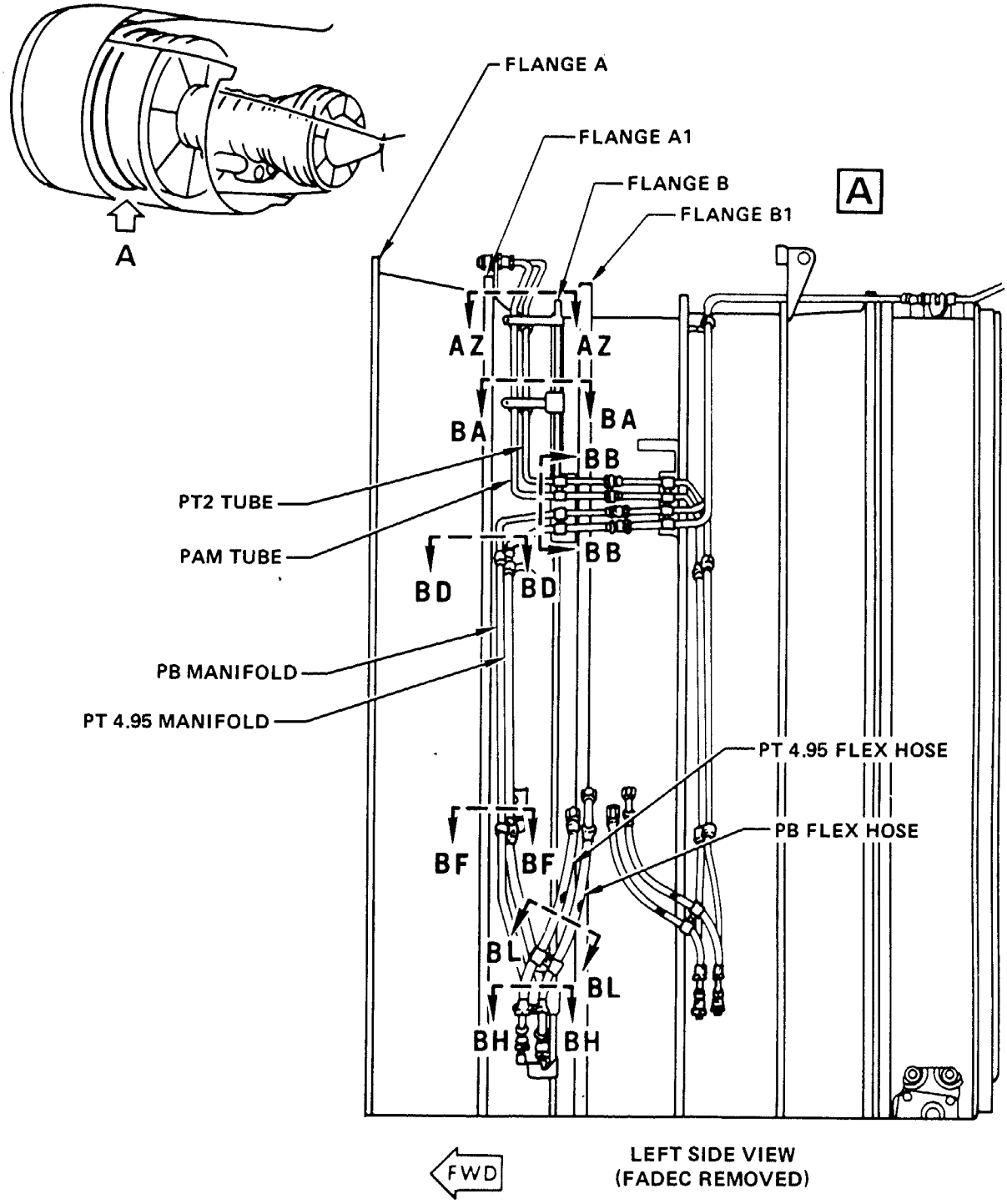
A. Equipment and Materials

ITEM	DESIGNATION
A.	Blanket, Insulation
B.	Tape, Lacing
C.	Bergen Mechanical Crimper (optional) Model M303, M305 or M307
D. PWA85677	Bracket, Handling
E. PWA87503	Handle, Nut
F. Material No.P03-001	Oils (Ref. 70-00-00)
G. Material No.P05-289	Special Materials (Ref. 70-00-00)
H. Material No.P05-291	Special Materials (Ref. 70-00-00)
I. Material No.P05-292	Special Materials (Ref. 70-00-00)
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 72-21-02, P. Block 401	First Stage Compressor Rotor (Fan) Blades Assembly
- 73-21-01, P. Block 401	Full Authority Digital Engine Control Unit (FADEC)
- 73-21-15, P. Block 401	Supplemental Control Unit (SCU)

B. Job Set-Up

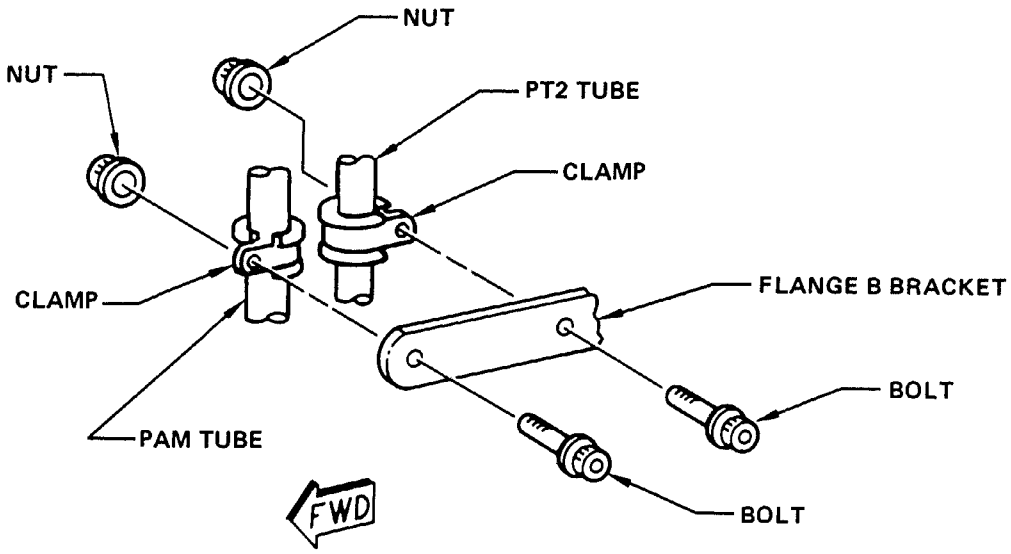
(1)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove first stage compressor rotor (fan) blades assembly (Ref. 72-21-02, P. Block 401).
(3)Remove FADEC (Ref. 73-21-01, P. Block 401).
(4)Remove SCU (Ref. 73-21-15, P. Block 401).

C. Removal (Ref. Fig. 407, 409, 410)
(Ref. Fig. 411, 412, 413)

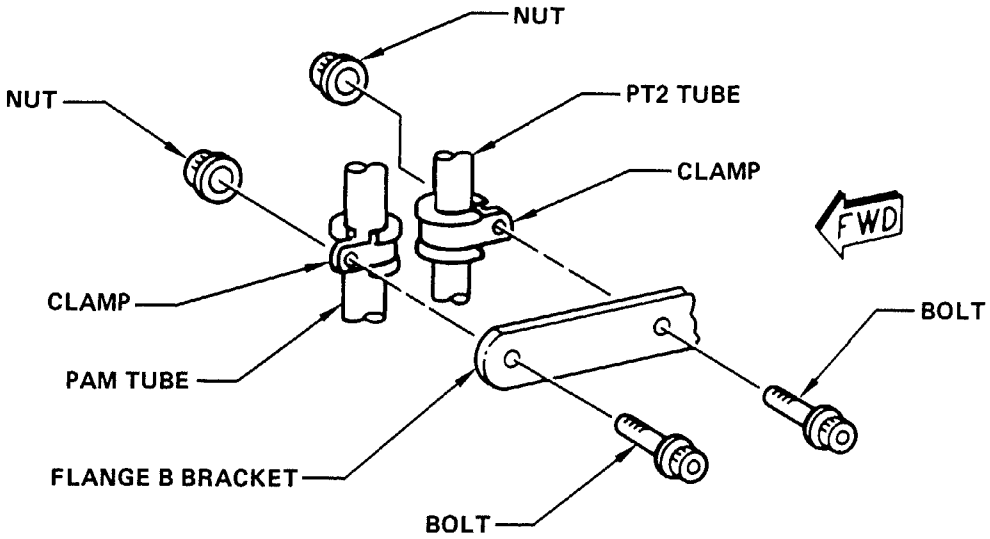


BM5 72 23 01 4 KAMA - 23

External Plumbing (Sheet 1/7)
Figure 401



VIEW AZ-AZ

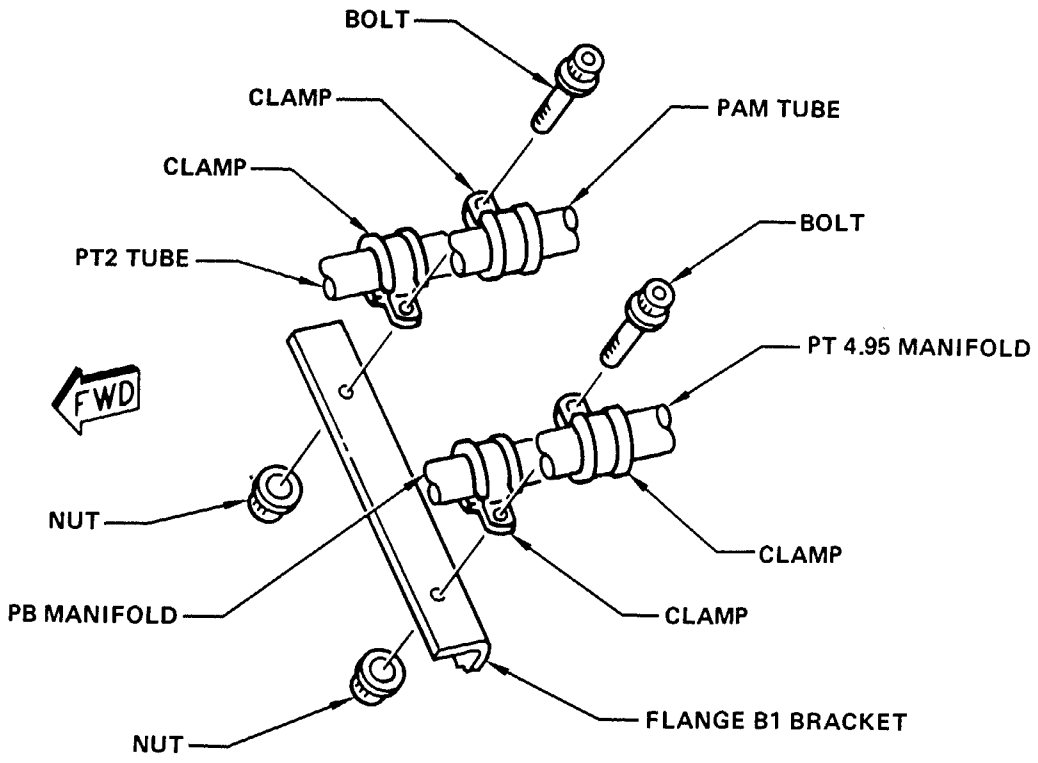


VIEW BA-BA

BM5 72 23 01 4 KAMC - 23

L-A1211

External Plumbing (Sheet 2/7)
Figure 401



VIEW B B-B B

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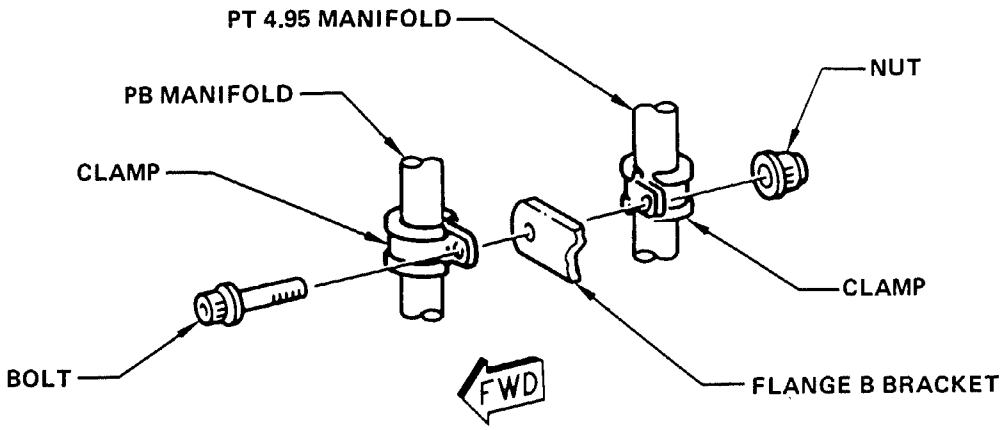
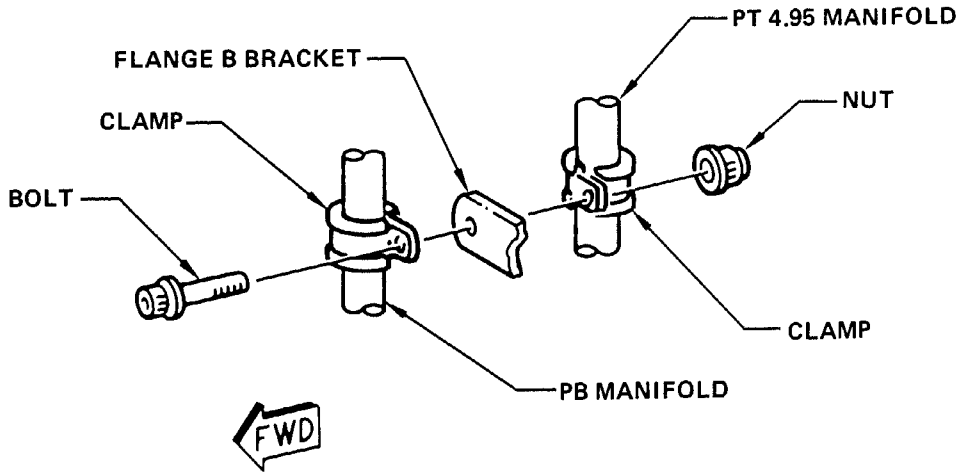
L-A1212

External Plumbing (Sheet 3/7)
Figure 401



VIEW B D-B D

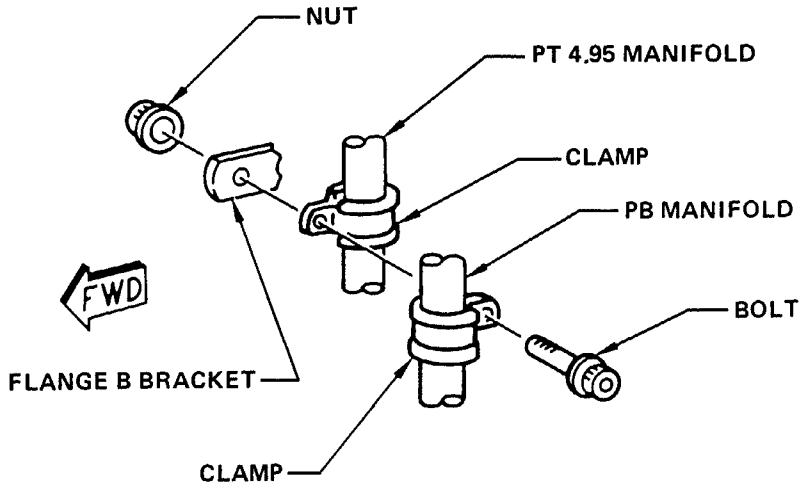


VIEW B F-B F

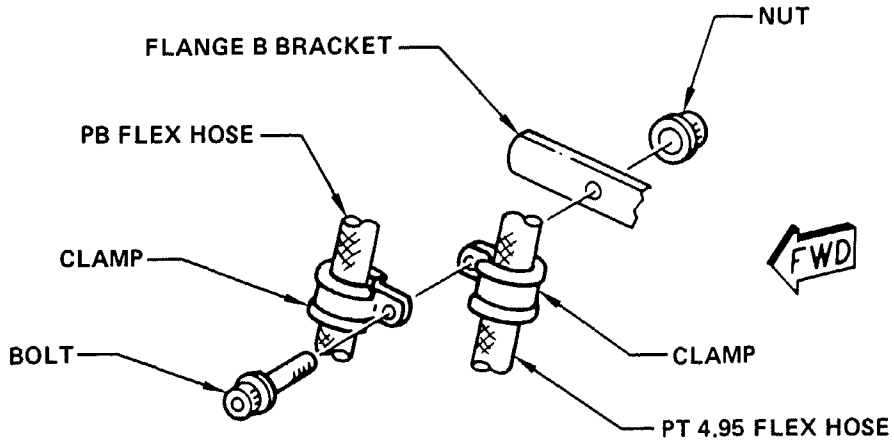
BM5 72 23 01 4 KAMG - 23

L-A1213

External Plumbing (Sheet 4/7)
Figure 401



VIEW BH-BH

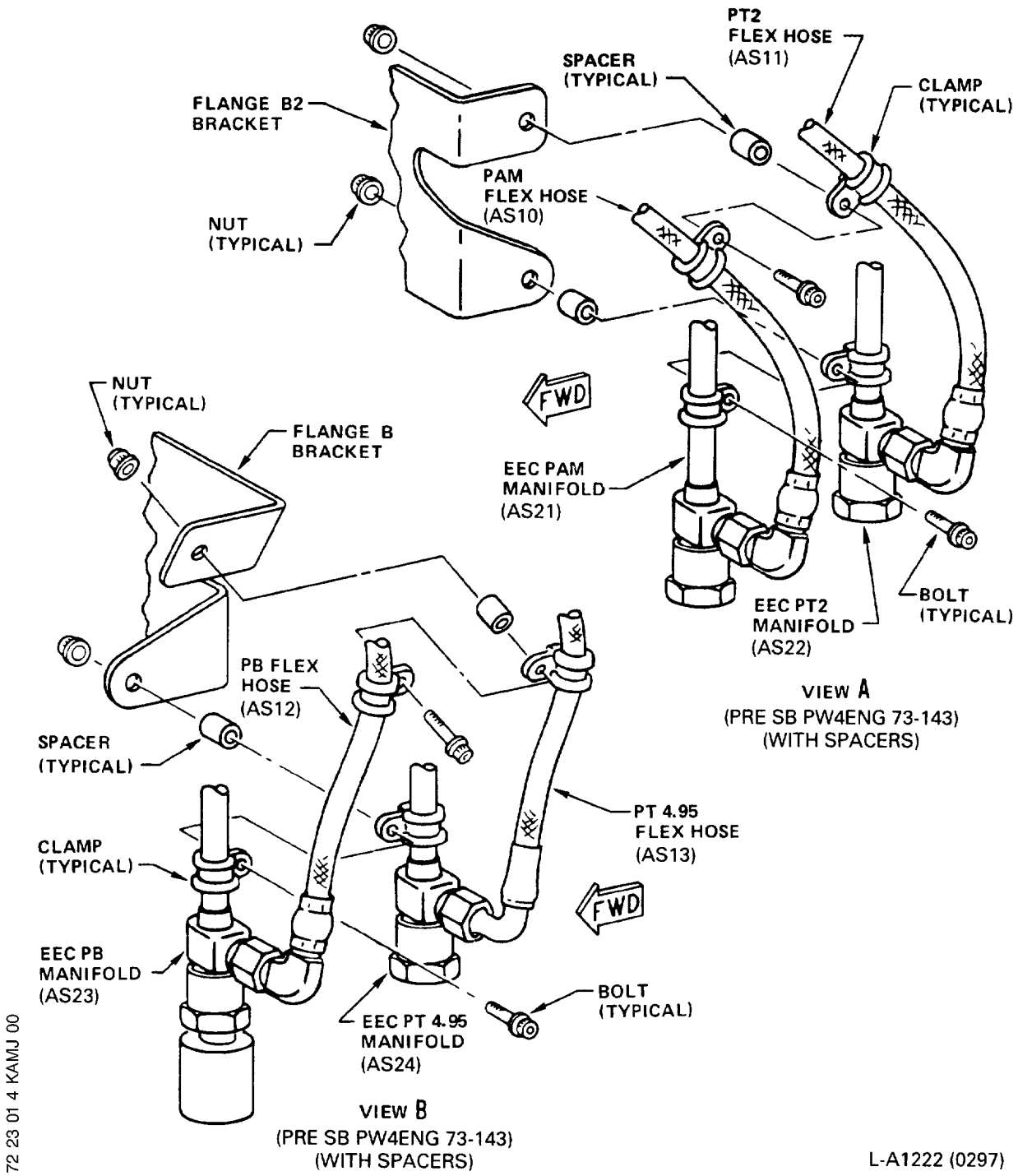


VIEW BL-BL

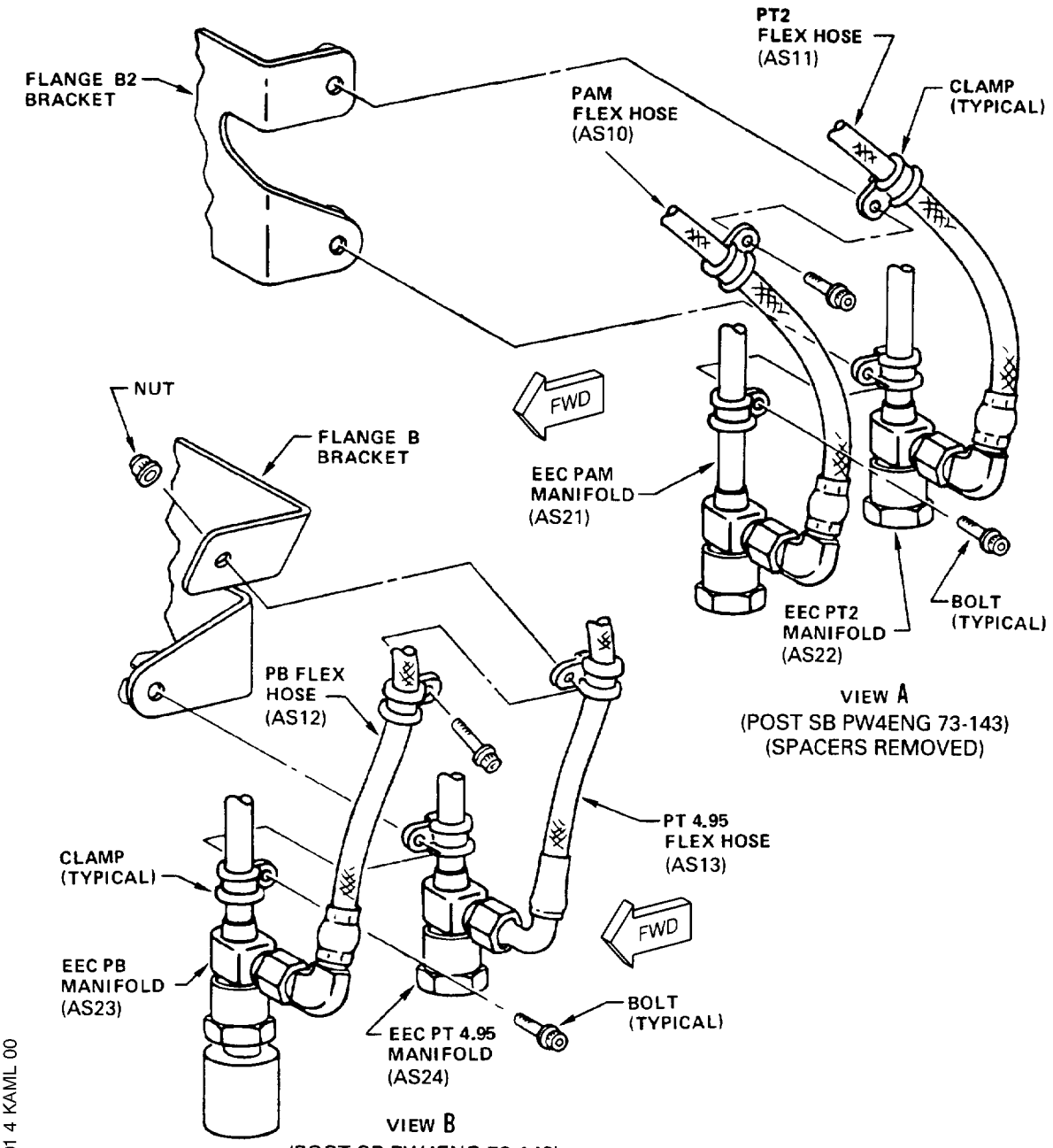
L-A1214

BM5 72 23 01 4 KAMH - 23

External Plumbing (Sheet 5/7)
Figure 401



External Plumbing (Sheet 6/7)
Figure 401



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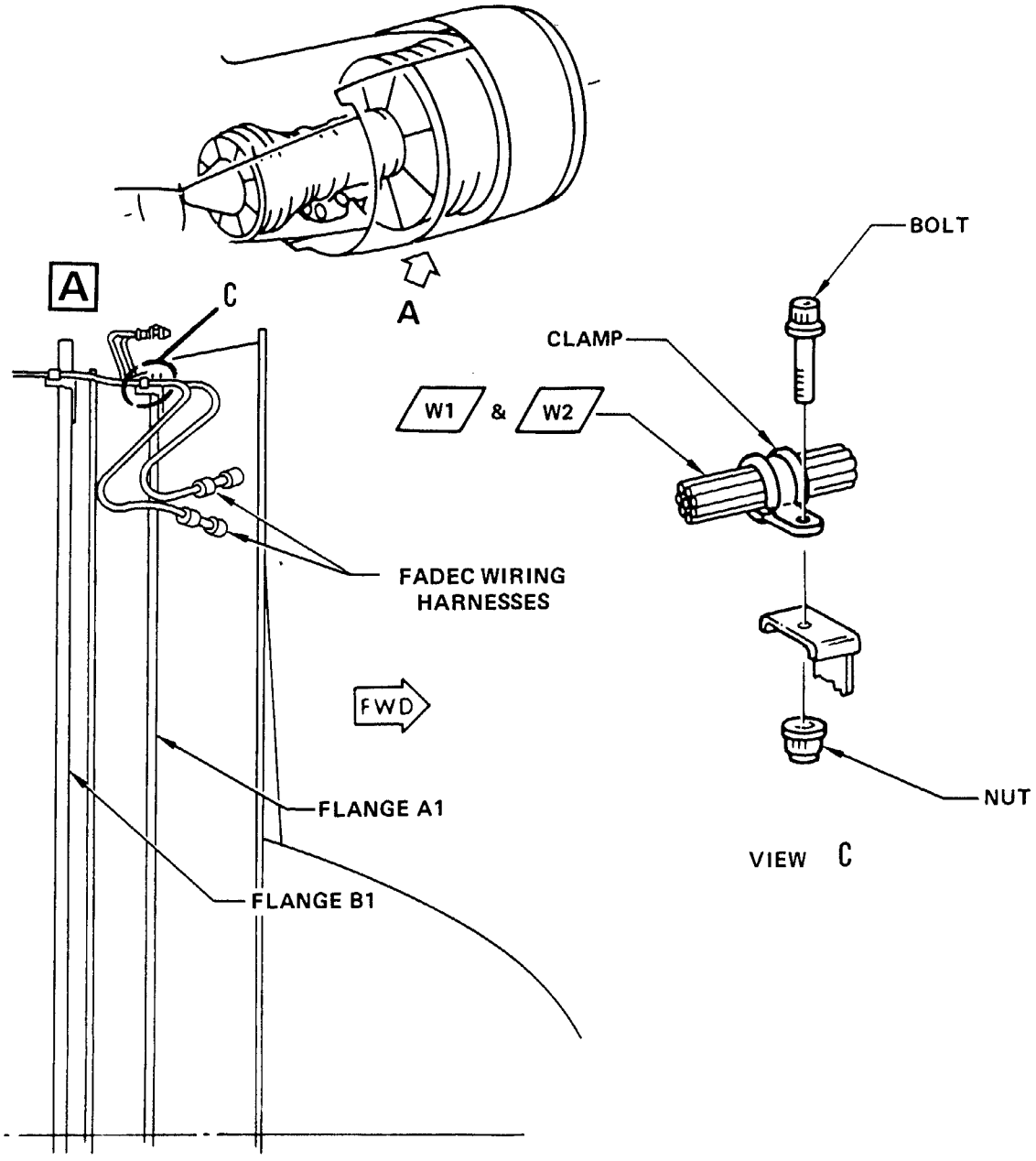
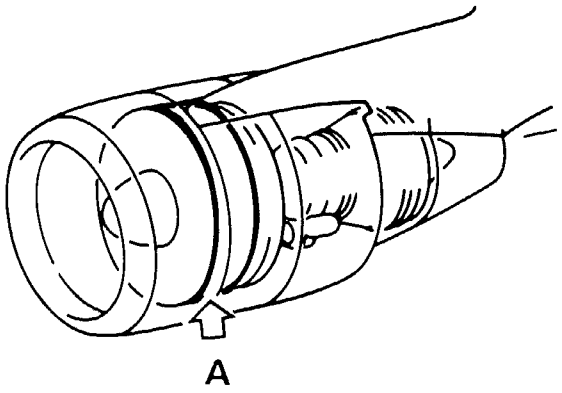
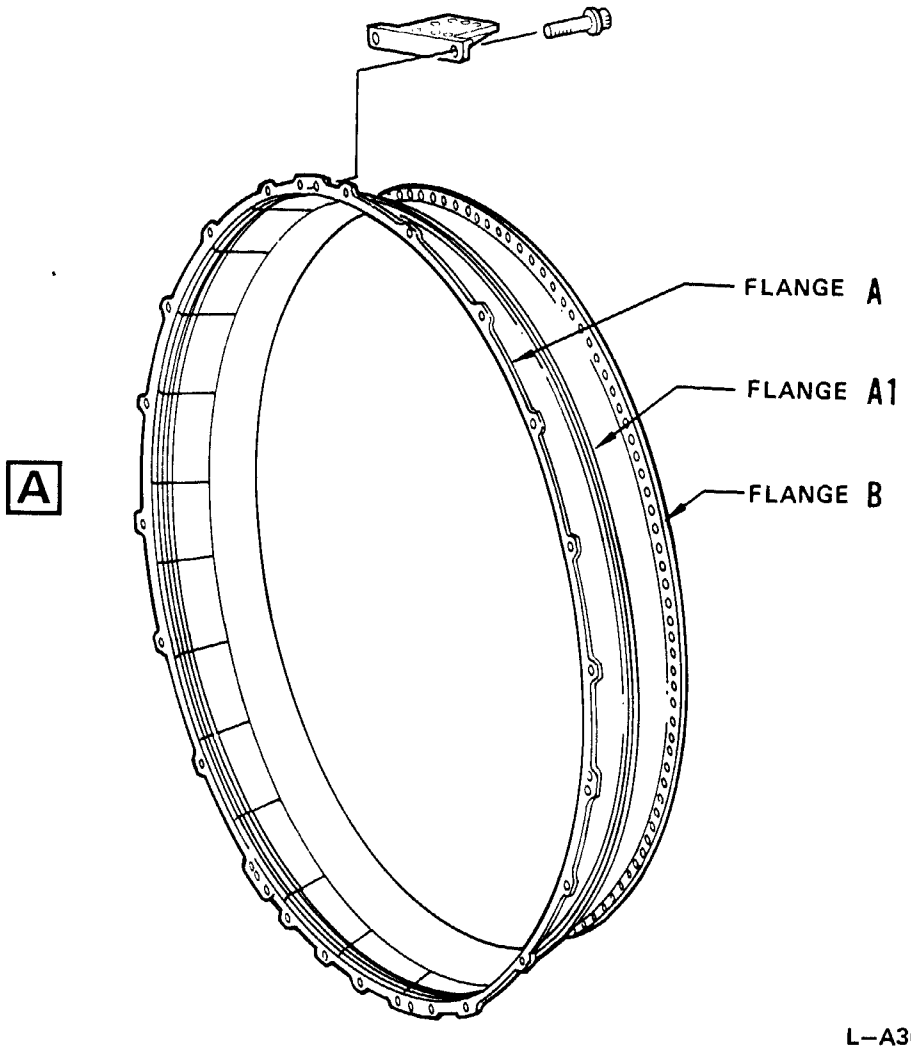
External Plumbing (Sheet 7/7)
Figure 401



Electrical Harness
Figure 402





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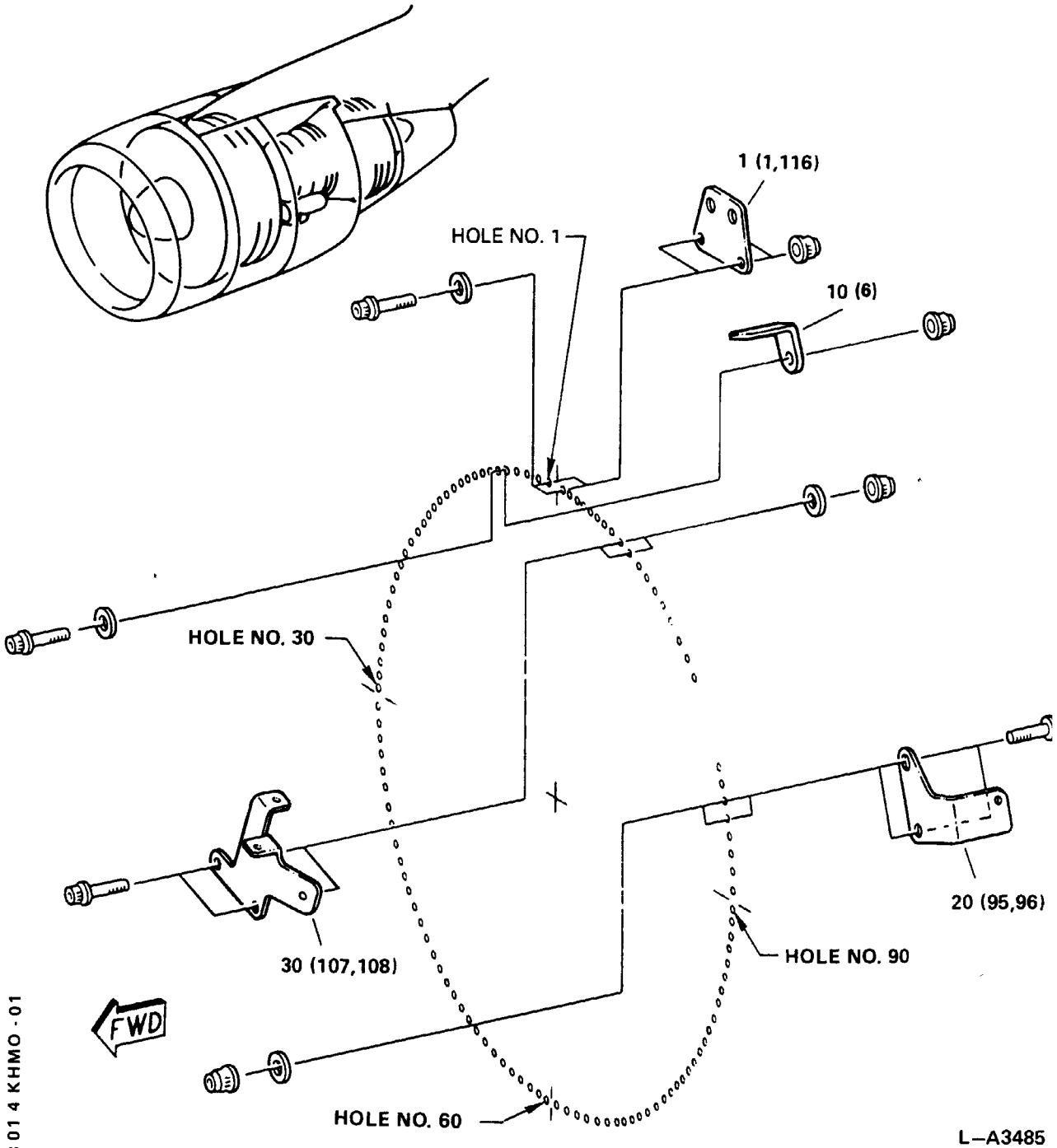
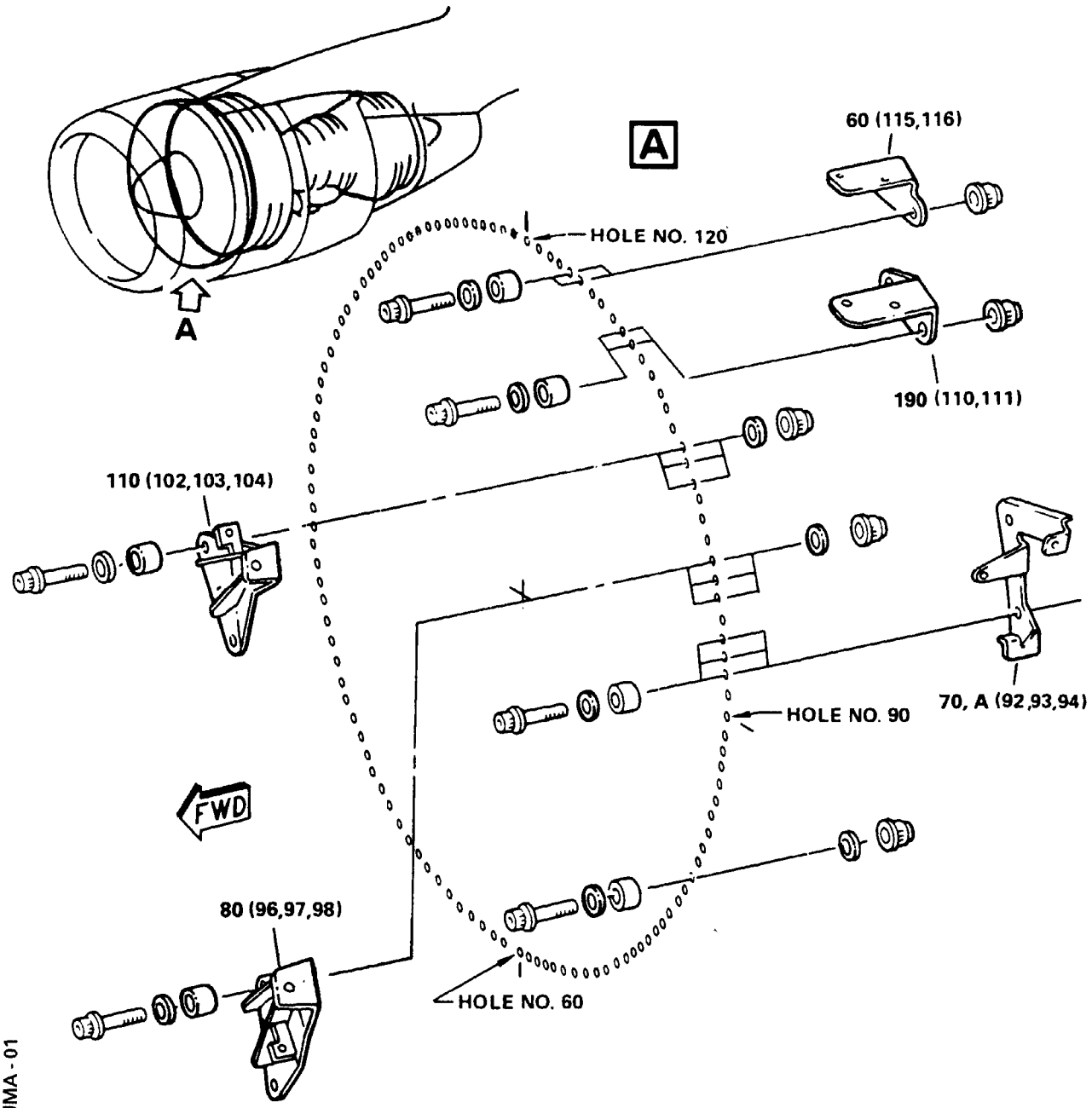
Front Fan Case Flange A Bracket Locations
Figure 403

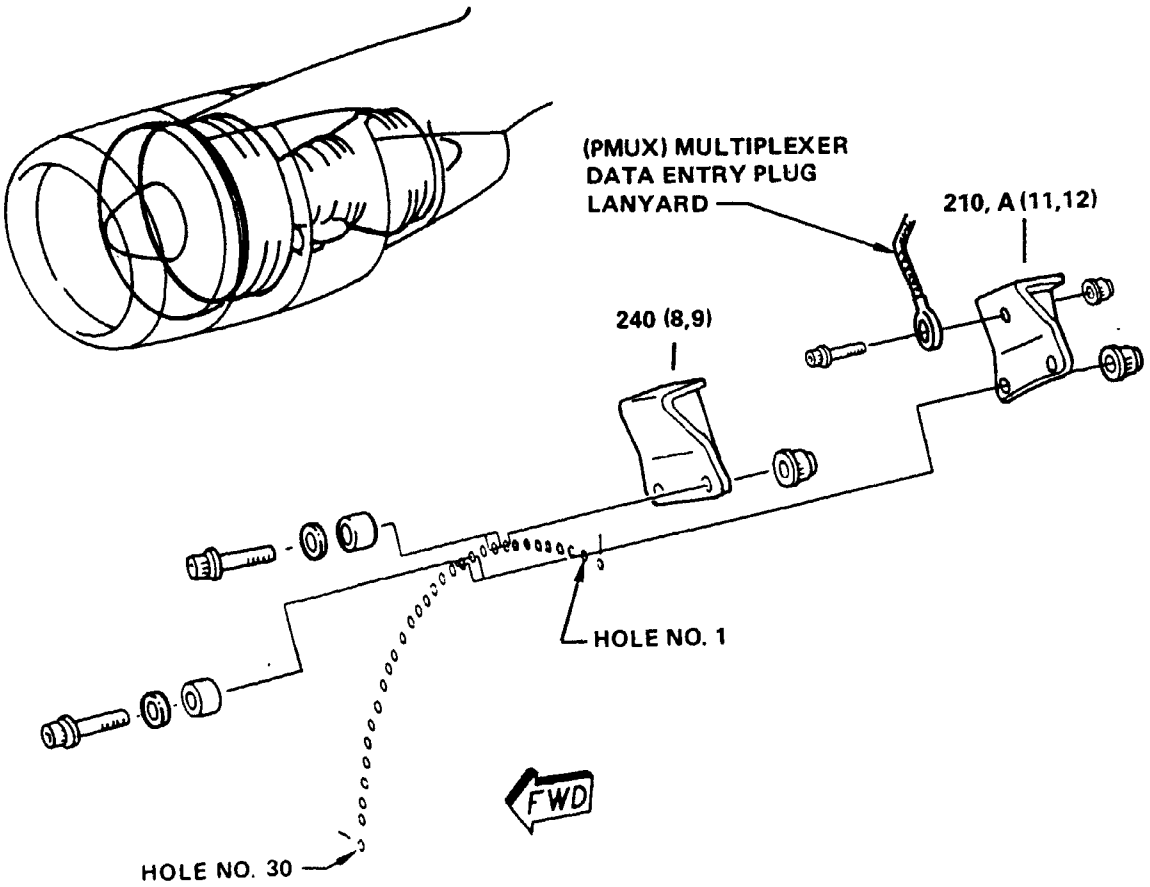


Front Fan Case Flange A1 Bracket Locations
Figure 404



(NUMBERS IN PARENTHESIS REPRESENT BOLTHOLE LOCATIONS) L-A3486 (0791)

Front Fan Case Flange B Bracket Locations (Sheet 1/2)
Figure 405

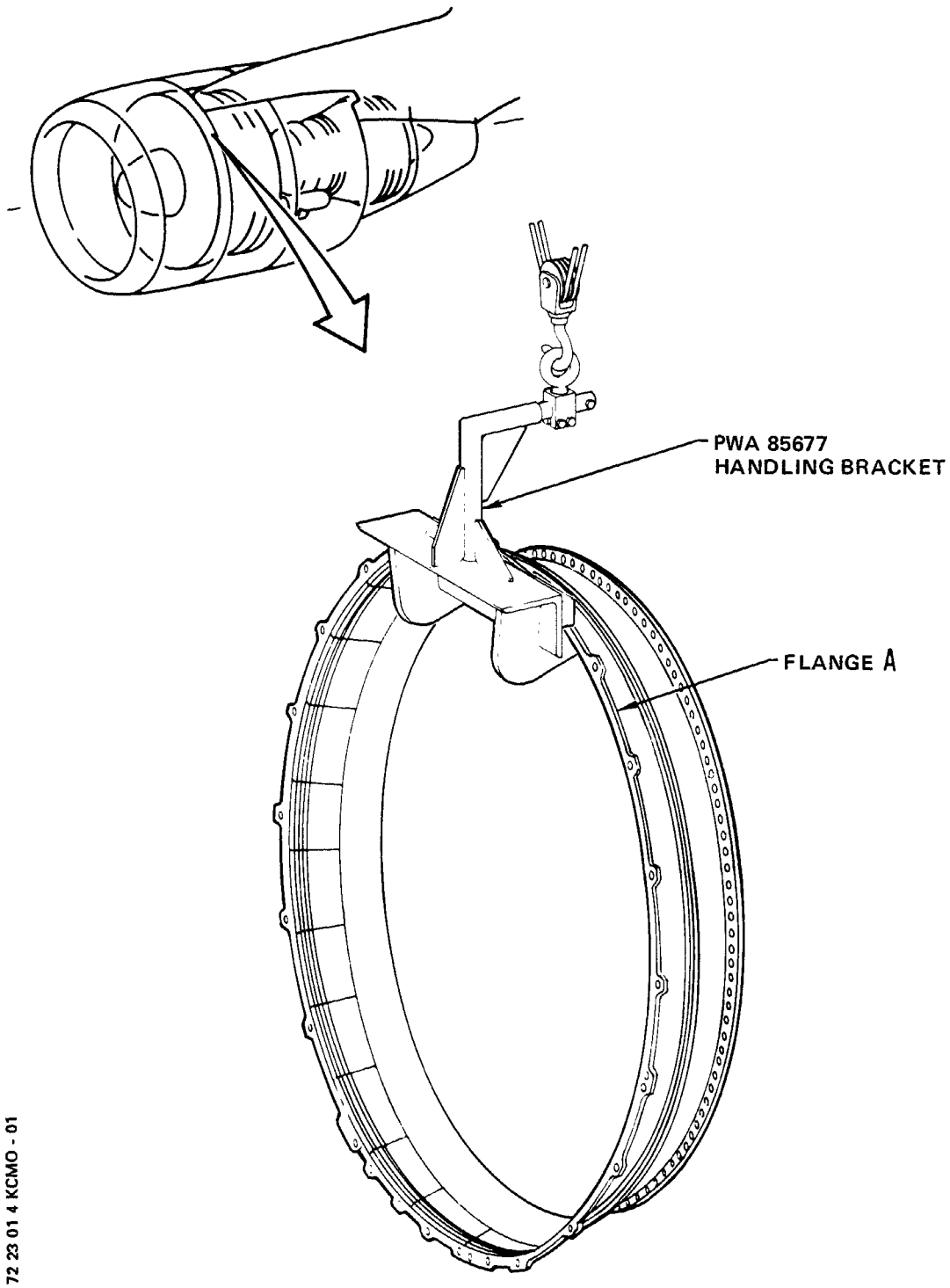


FOR ENGINES EQUIPPED WITH ENGINE PROPULSION MULTIPLEXER ONLY
(NUMBERS IN PARENTHESIS REPRESENT BOLTHOLE LOCATIONS)

L-A3487 (0791)

BM5 72 23 01 4 KJMC - 01

Front Fan Case Flange B Bracket Locations (Sheet 2/2)
Figure 405



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Front Fan Case Handling Bracket
Figure 406

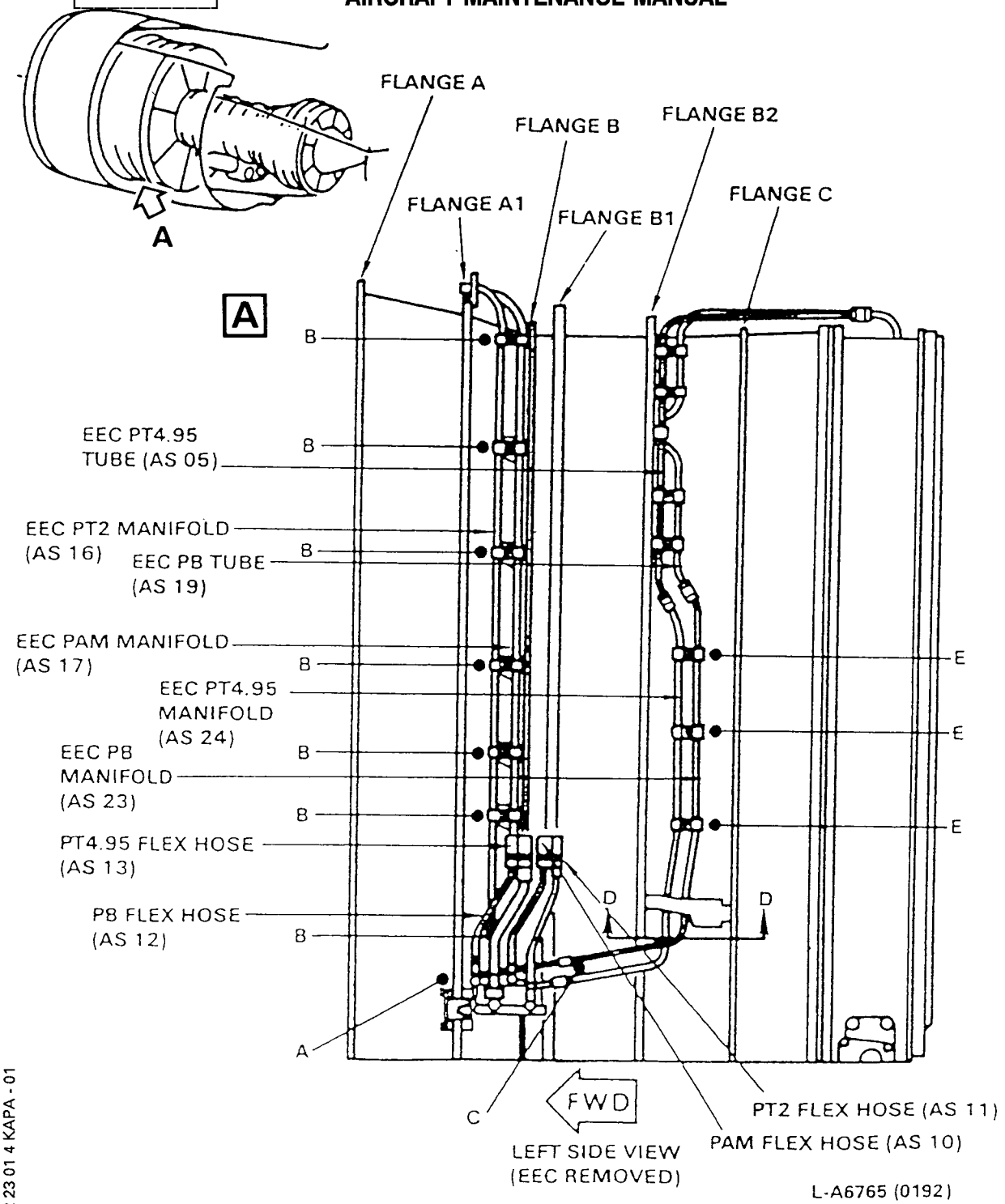
(1)Remove the PT2 (AS11), PAM (AS10), PT4.95 (AS13) and PB (AS12) flex hose assemblies as follows (Ref. Fig. 407) (Sheet 2/4).
  (a)Disconnect the hose nuts from the manifold tees at a bracket between Flanges A1 and B1 at the 9 o'clock position.
  (b)Remove the flex hoses from the engine and install protection covers.
(2)Remove the FADEC PB sensing manifold (AS23) as follows.
  (a)Remove the lockwire and disconnect the tube nut from the manifold assembly at the 10:30 o'clock position.
  (b)Remove the bolt and clamp that attaches the manifold to a bracket on Flange B1 at the 9 o'clock position.
  (c)Remove the bolt, clamp and nut that attach the W2 harness and the AS23 manifold and the FADEC PT4.95 manifold (AS24) to a bracket between (bridged) Flanges B2 and C at the 9:30 o'clock position.
  (d)Remove the nuts and clamps that attach the manifold to three brackets (rearward of Flange B2) on the fan case.
  (e)Remove the bolt that attaches the tee of the manifold to a bracket between Flanges A1 and B1 at the 9 o'clock position.
  (f)Remove the manifold assembly from the engine and install protection covers.
(3)Remove the FADEC PAM manifold assembly (AS17) as follows.
  (a)Remove the lockwire and disconnect the manifold nut from the bulkhead adapter on a bracket at Flange A1 at the 12 o'clock position.
  (b)Remove the bolts and clamps that attach the manifold to seven brackets on Flange B.
  (c)Remove the bolt that attaches the tee of the manifold to a bracket located between Flanges A1 and B1 at the 9 o'clock position.
  (d)Remove the manifold from the engine and install protection covers.
(4)Remove the FADEC PT4.95 sensing manifold assembly (AS24) as follows.
  (a)Remove the lockwire and disconnect the tube nut from the manifold assembly at the 10:30 o'clock position.
  (b)Remove the bolt and clamp that attaches the manifold to a bracket on Flange B1 at the 9 o'clock position.
  (c)Remove the clamps that attach the manifold to three brackets (rearward of Flange B2) on the fan case.
  (d)Remove the clamp from the manifold at a bracket located between Flanges B2 and C at the 9:30 o'clock position (bolt and nut was previously removed with the AS23 manifold).
  (e)Remove the bolt that attaches the tee of the manifold to a bracket between Flanges A1 and B1 at the 9 o'clock position.
  (f)Remove the manifold assembly from the engine and install protection covers.
(5)Remove the FADEC PT2 manifold assembly (AS16) as follows.
  (a)Remove the lockwire and disconnect the manifold nut from the bulkhead adapter in a bracket on Flange A1 at the 12 o'clock position.
  (b)Remove the clamps that attach the manifold to seven brackets on Flange B.
  (c)Remove the bolt that attaches the tee of the manifold to a bracket located between Flanges A1 and B1 at the 9 o'clock position.
  (d)Remove the manifold from the engine and install protection covers.
(6)For engines equipped with the supplemental control unit (SCU) with multiplexing, remove the PT2.5 sensing hose assembly (AS38) and PT2.5

sensing manifold assembly (AS36).
(Ref. Fig. 408)
NOTE : The programming plug can stay attached to the rear of the lower SCU mount bracket.

(a) Remove the AS38 hose from the tee of the AS36 manifold at the 3 o'clock position. Install protection covers on the hose assembly.
(b) Remove the lockwire and disconnect the tube nut to the coupling of the AS36 manifold at the 2 o'clock position.
(c) Remove the bolts, nuts and clamps that attach the AS36 manifold to brackets on Flanges B, B2 and C.
(d) Remove the bolt from the tee of the AS36 manifold that attaches the manifold to a bracket on Flange B at the 3 o'clock position. Remove the manifold from the engine and install protection covers to the manifold openings.

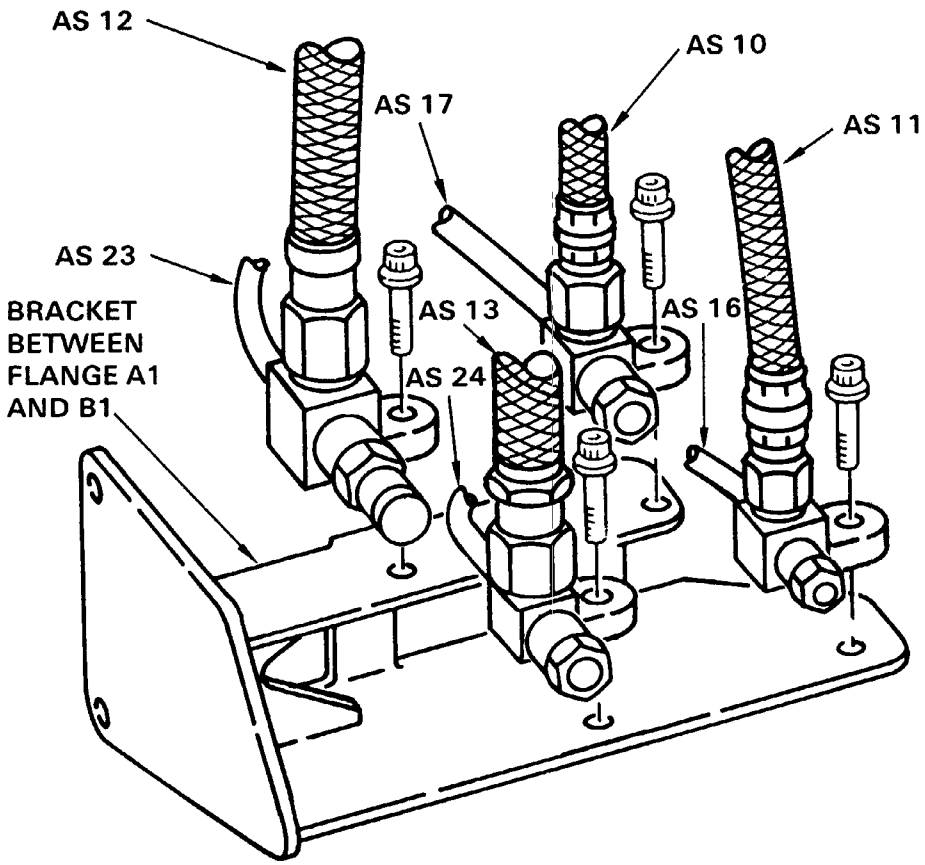
CAUTION : DO NOT TWIST OR BADLY BEND THE WIRING HARNESS DURING REMOVAL. TWISTING OR BADLY BENDING THE WIRING HARNESS CAN DAMAGE THE WIRING HARNESS.

(7) For engines equipped with the supplemental control unit (SCU) do the following :
(a) Remove the bolt, washer and nut that attach the SCU ground cable to a bracket on Flange B1. Remove the ground cable.
(8) Remove the eight bolts and clamps that attach the W11 harness to brackets on Flange A1 approximately at the 1:30 o'clock position. Temporarily attach the wiring harness rearward on Flange B.
(9) Remove the nut and clamp that attach the W2 harness to a bracket on Flange A1 at the 9:30 o'clock position.
Temporarily attach the wiring harness rearward of Flange B.
(10) Use the PWA 87503 Nut Handle and remove nuts, washers, spacers and bolts that attach brackets to Flange B. Remove the brackets from the engine.
NOTE : The ground cable and the programming plug can stay attached to the front upper FADEC mount bracket.
(11) Attach a PWA 85677 Handling Bracket to the front flange of the front fan case at the 12 o'clock position. Attach a hoist to the handling bracket.
(12) Remove the remaining nuts, washers, spacers and bolts from the rear of Flange B.
(13) Carefully hit (tap) the front fan case with a fiber mallet to loosen the flange.
(14) Remove the front fan case from the engine. Put the fan case on a pallet with rear flange down. Remove the hoist and bracket from the case.
(15) If a new case is to be installed, comply with the following :
(a) Remove the brackets from Flange A1.
(b) If applicable, remove the vibration pickup bracket from Flange A at approximately the 1 o'clock position.



BM5 72 23 01 4 KAPA - 01

External Plumbing (Sheet 1/4)
Figure 407

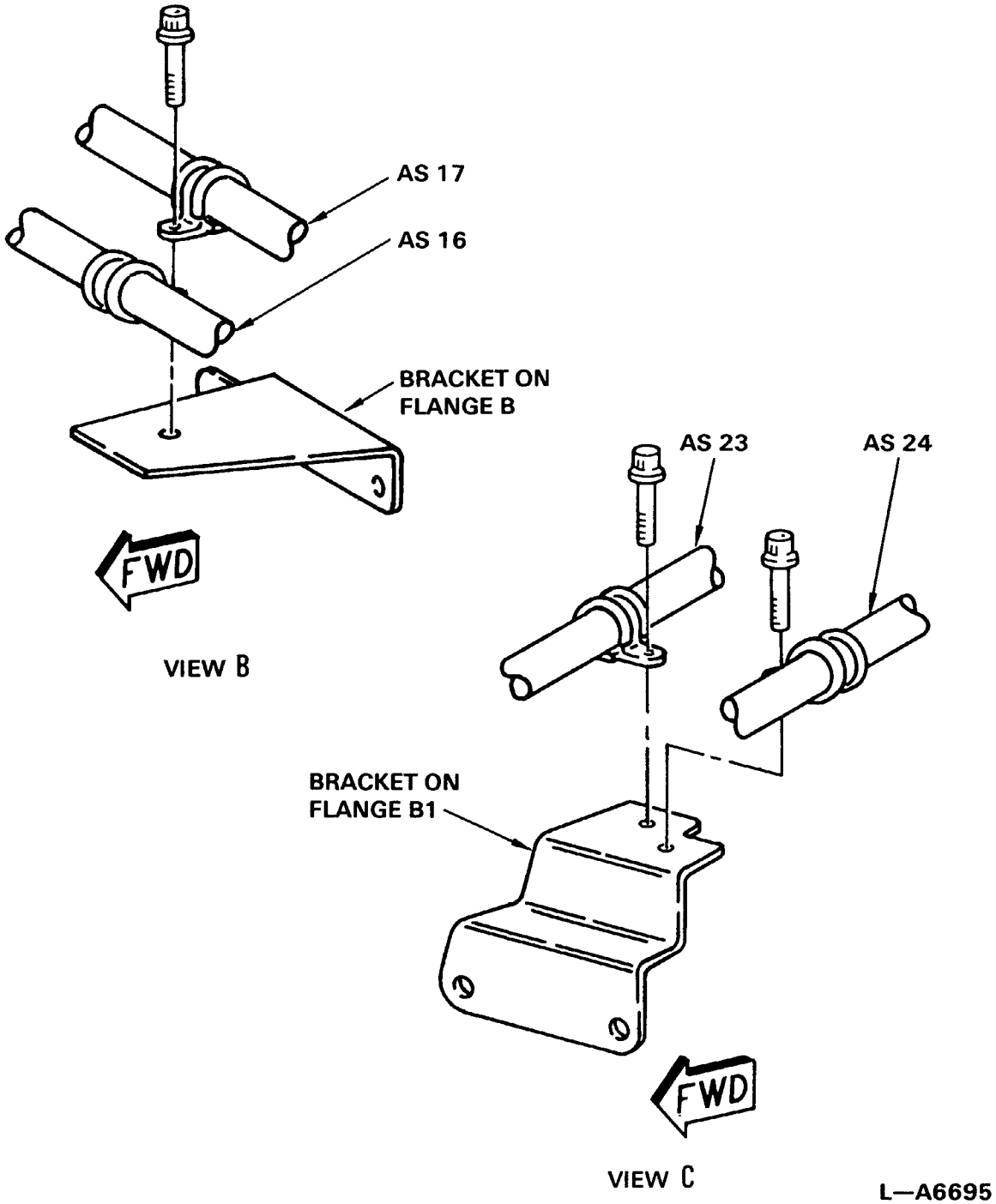


VIEW A

BM5 72 23 01 4 KAPC - 00

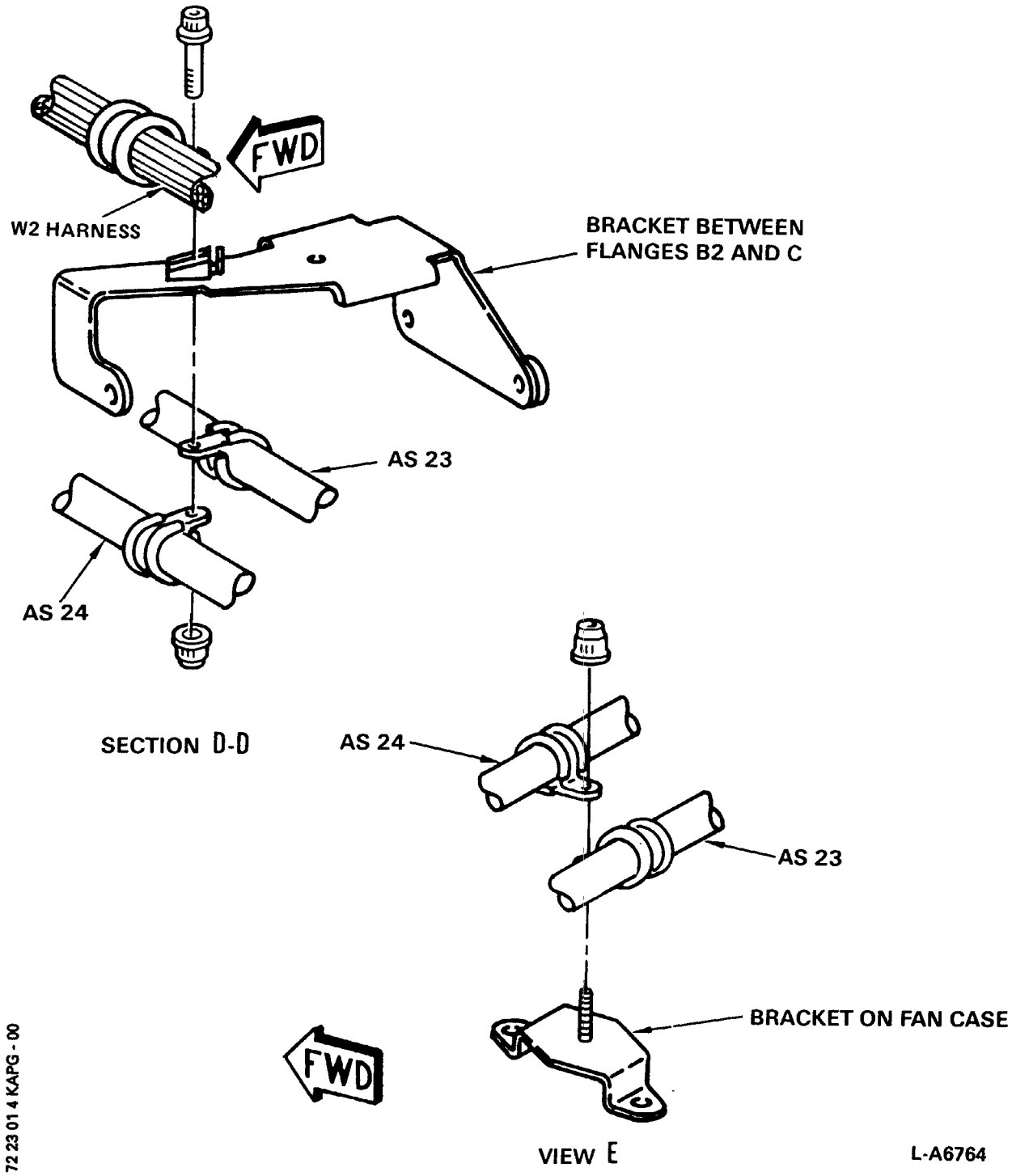
L—A6757

External Plumbing (Sheet 2/4)
Figure 407

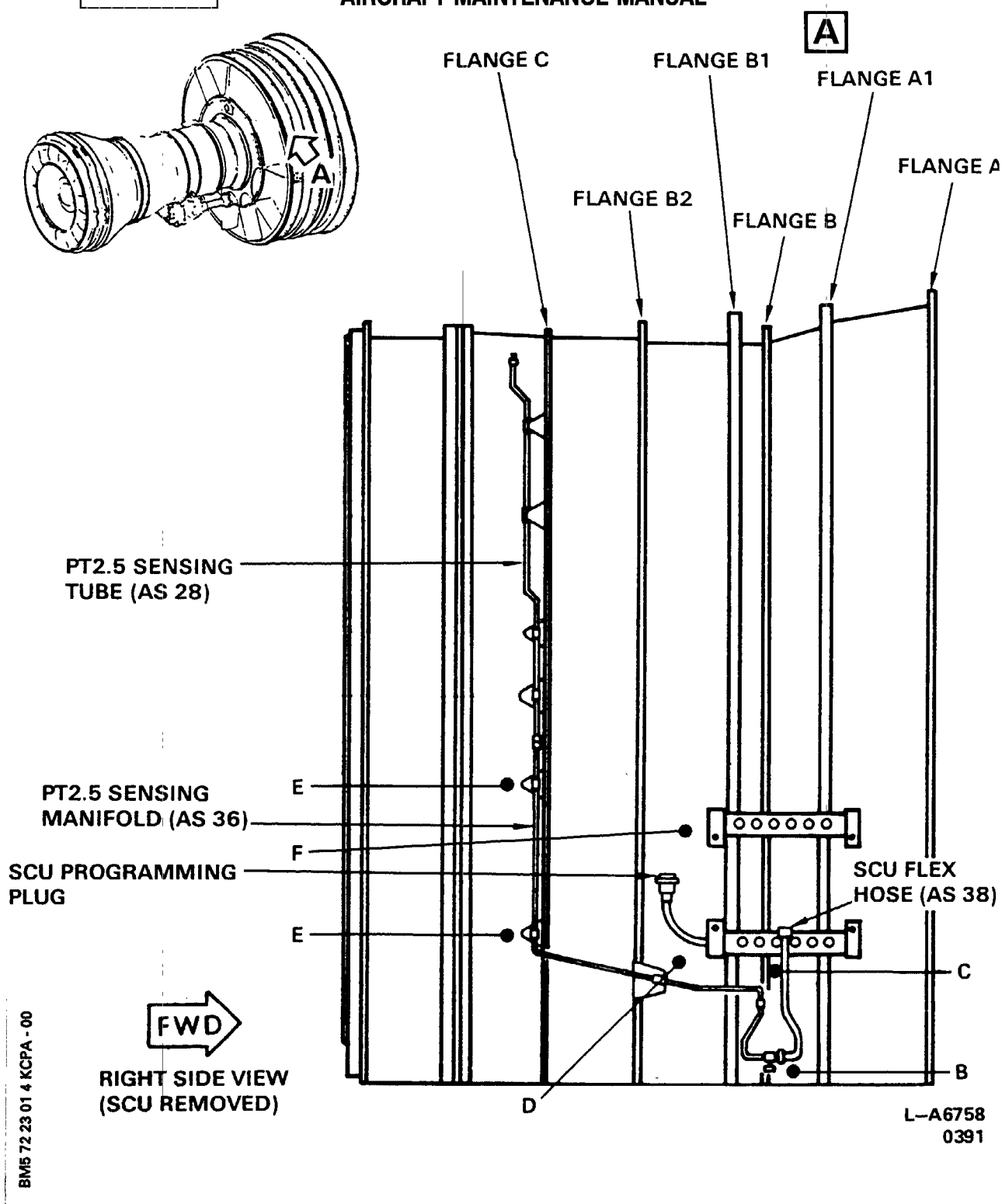


BM5 72 23 01 4 KAPE - 00

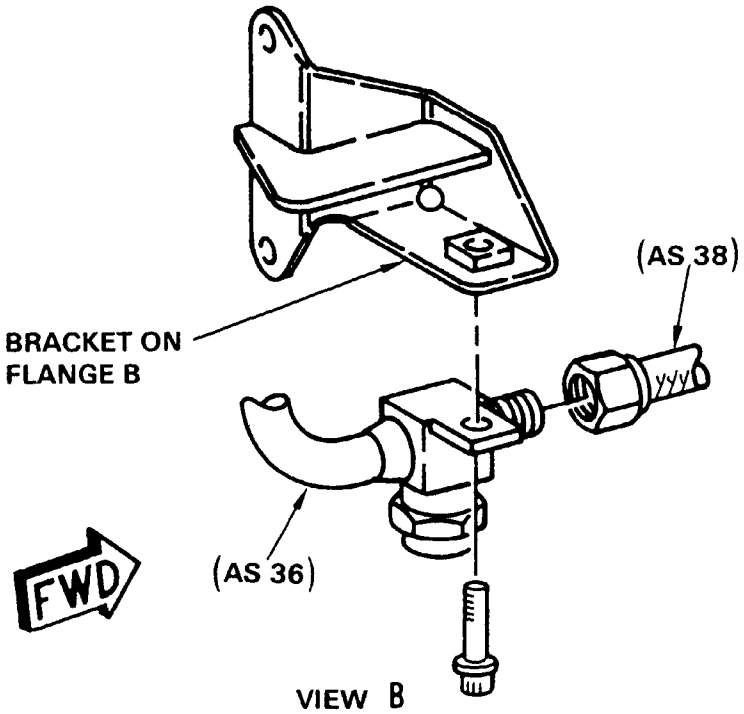
External Plumbing (Sheet 3/4)
Figure 407



External Plumbing (Sheet 4/4)
Figure 407



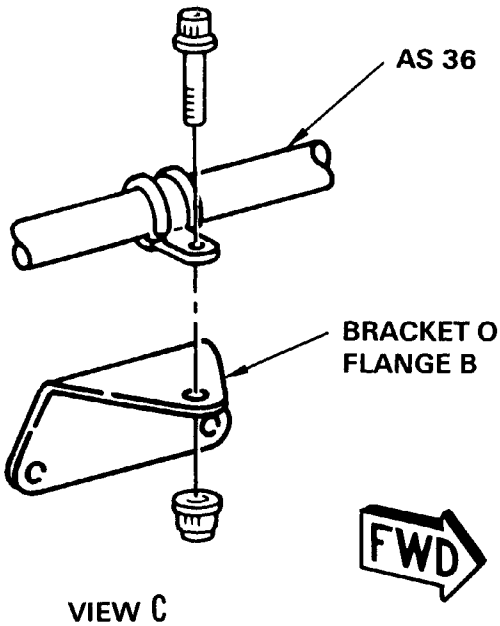
External Plumbing (SCU) (Sheet 1/4)
Figure 408



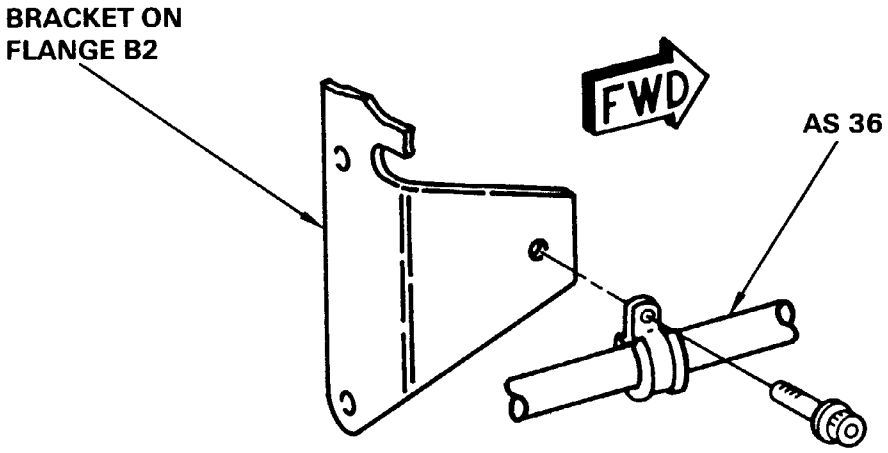
L-A6759
0391

BM5 72 23 01 4 KCPC - 00

External Plumbing (SCU) (Sheet 2/4)
Figure 408



VIEW C

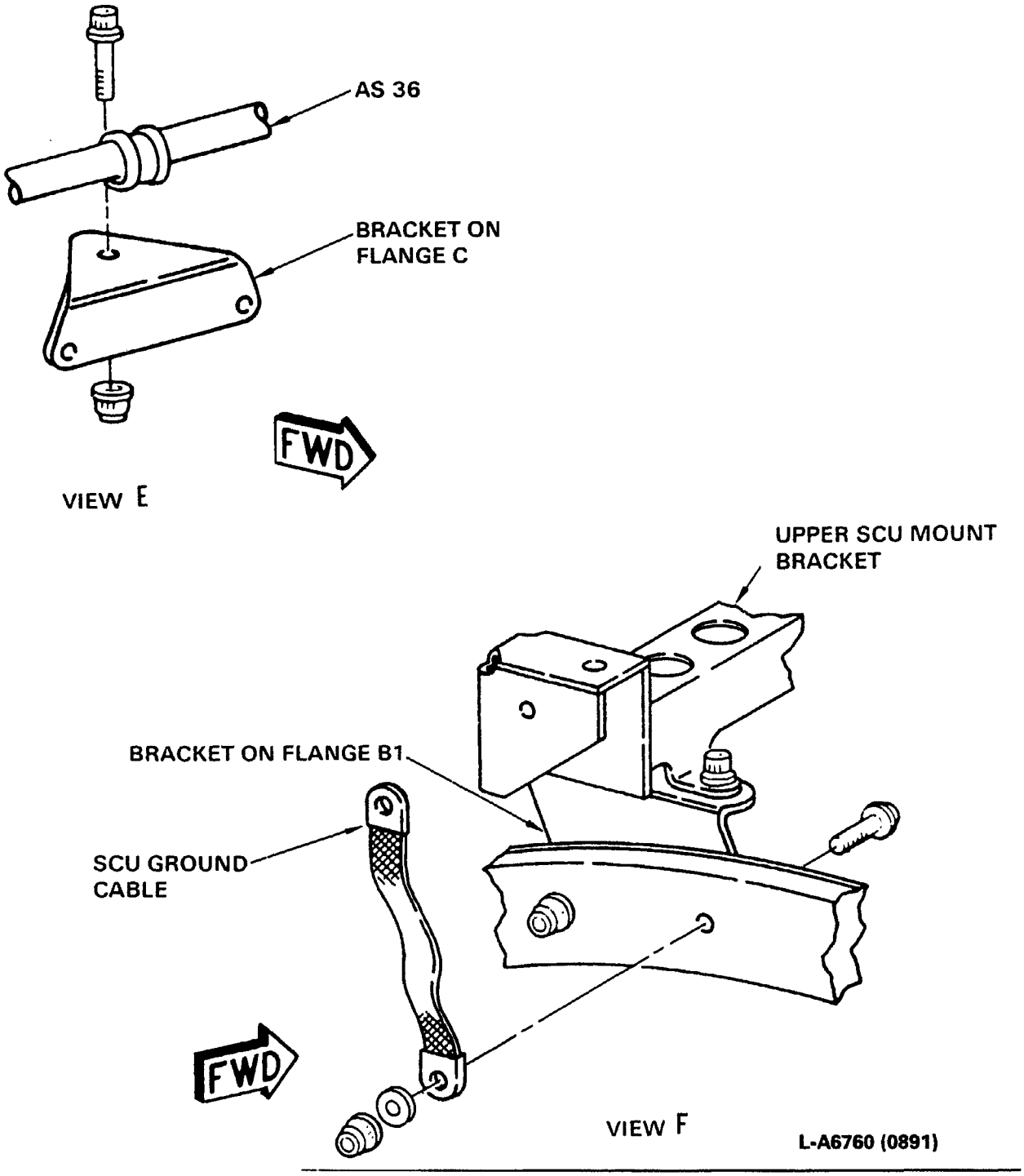


VIEW D

BM5 72 23 01 4 KCPE - 00

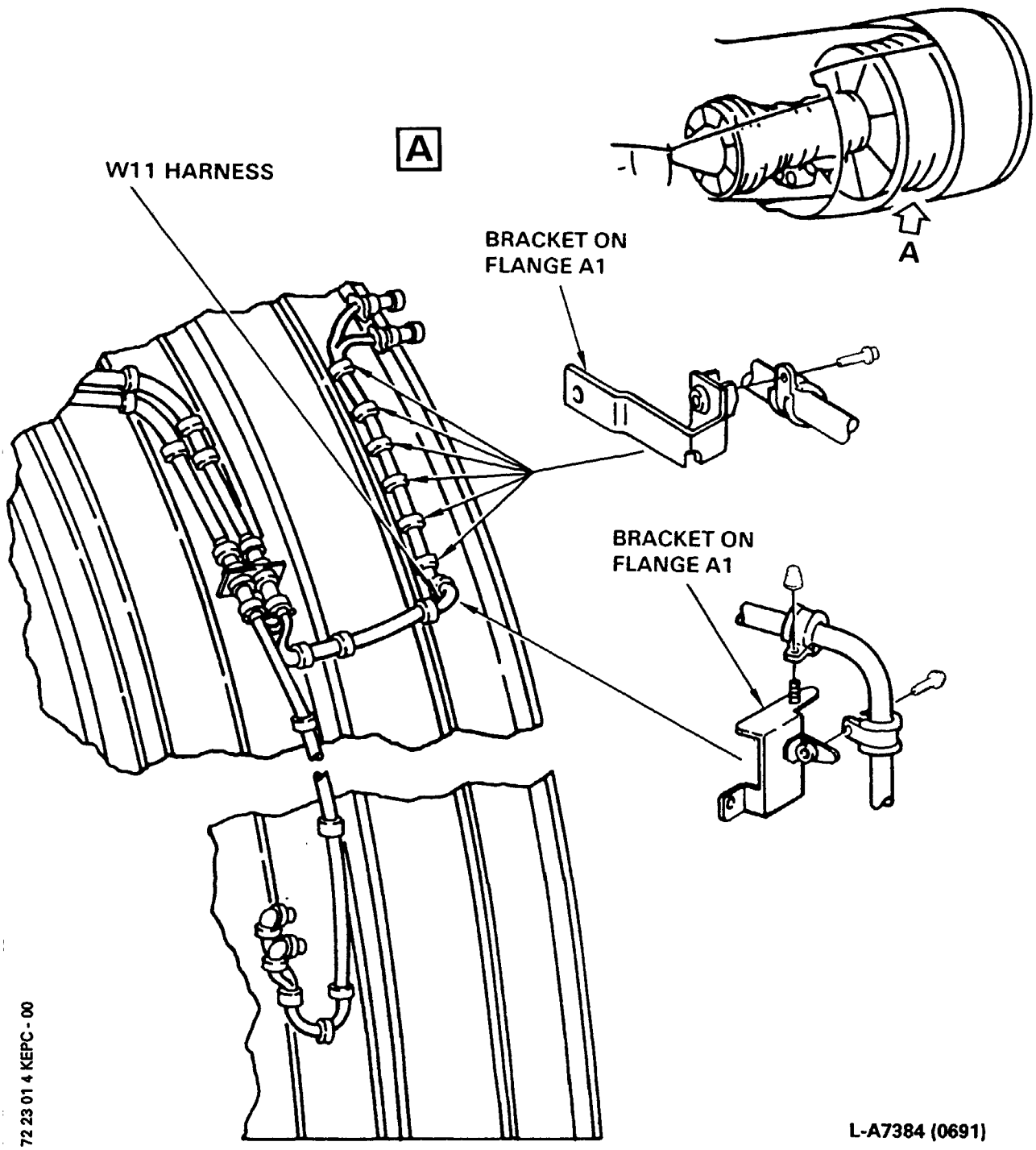
L—A6702

External Plumbing (SCU) (Sheet 3/4)
Figure 408

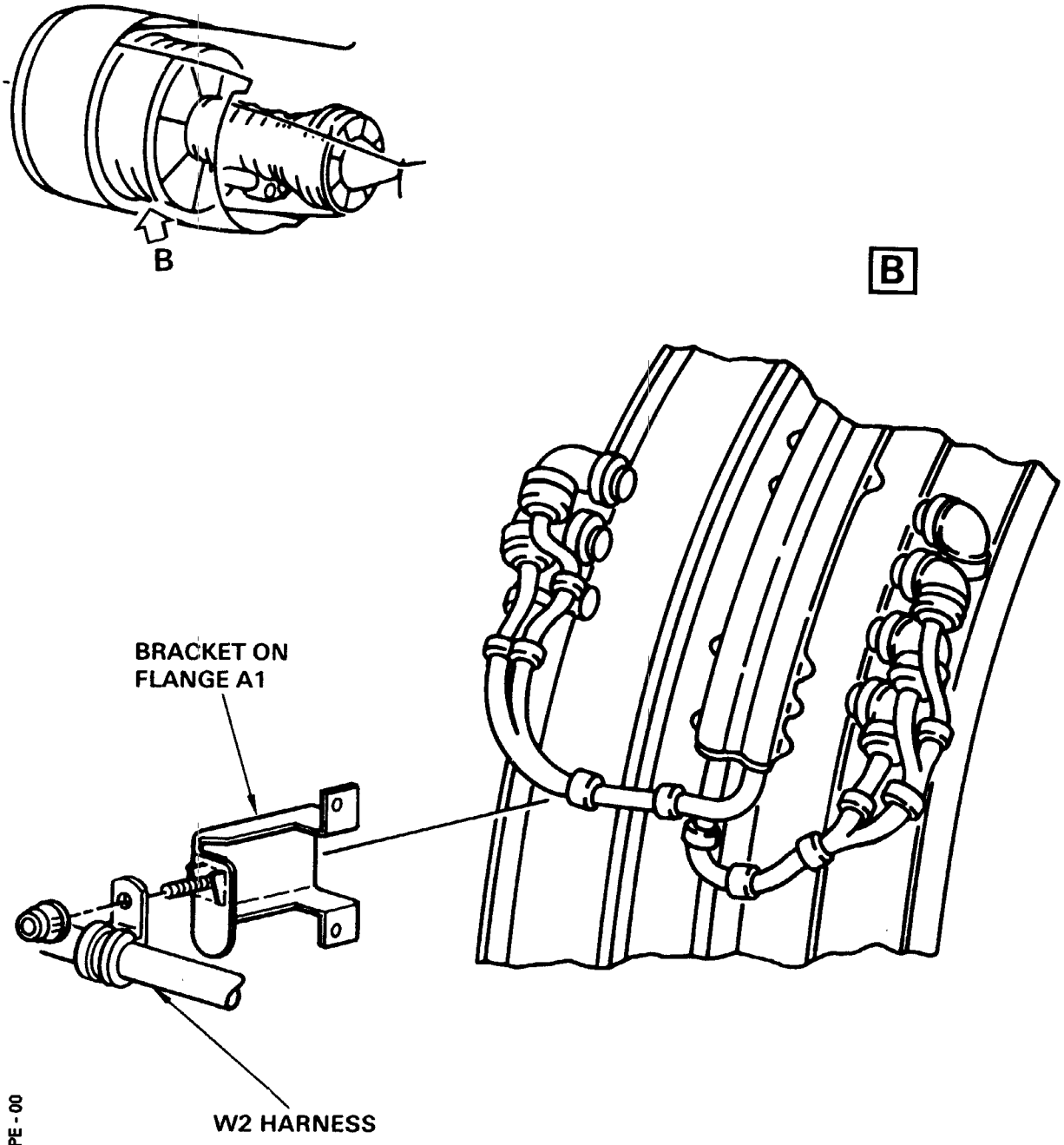


BM5 72 23 01 4 KCPG - 01

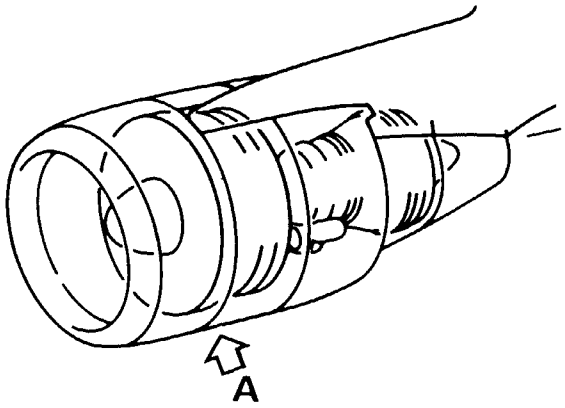
External Plumbing (SCU) (Sheet 4/4)
Figure 408

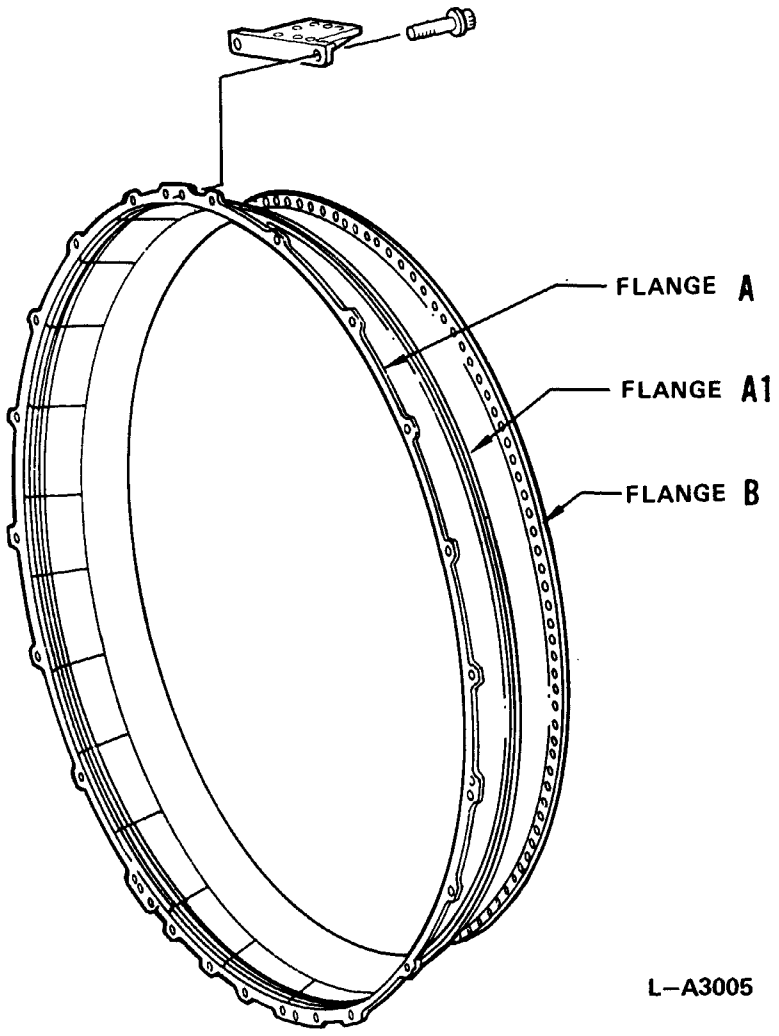


Wiring Harness (Sheet 1/2)
Figure 409



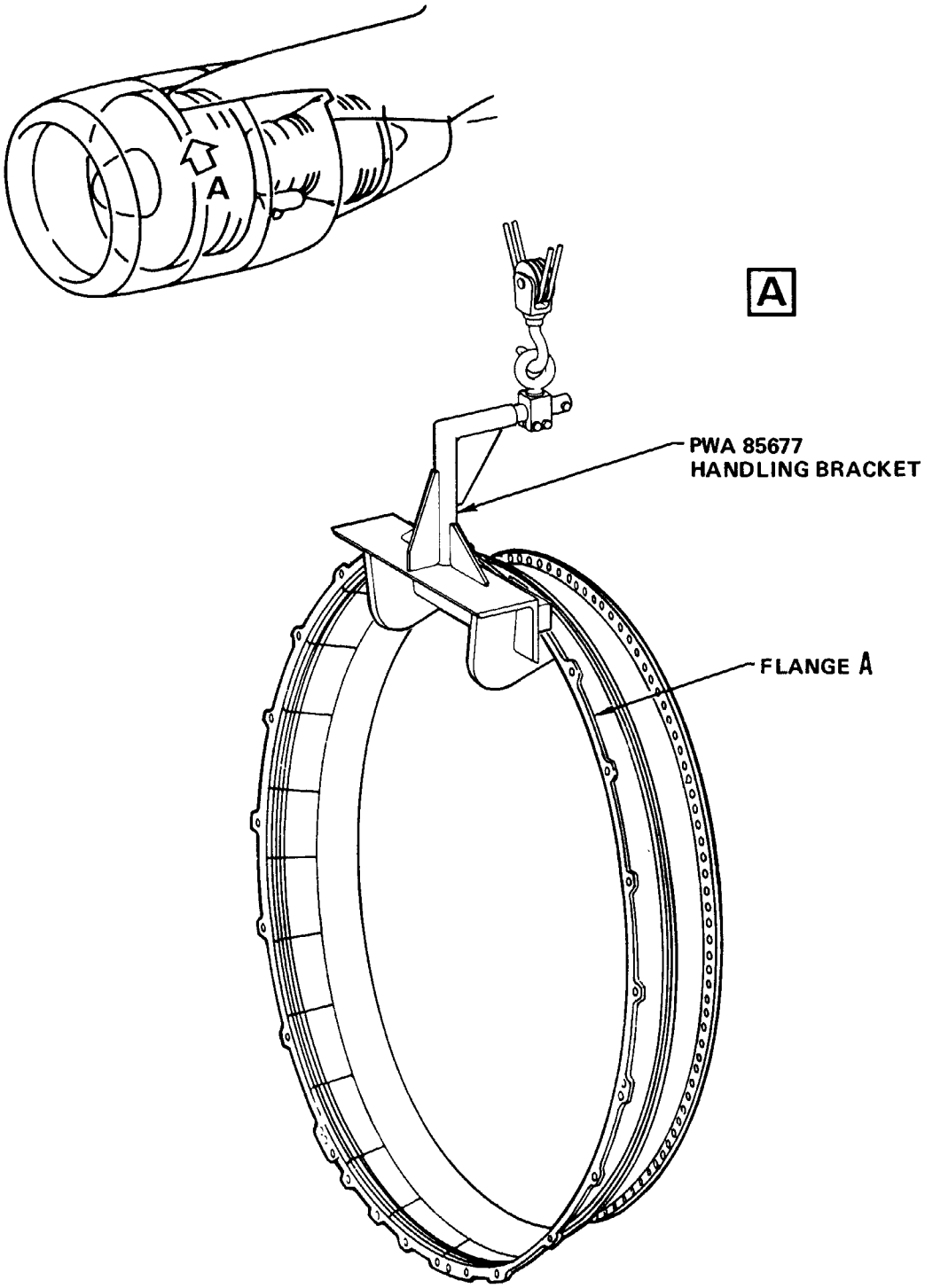
Wiring Harness (Sheet 2/2)
Figure 409





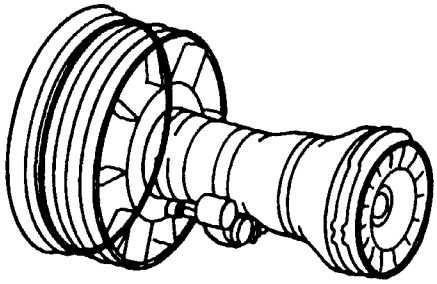
BM5 72 23 01 4 KGPO - 00

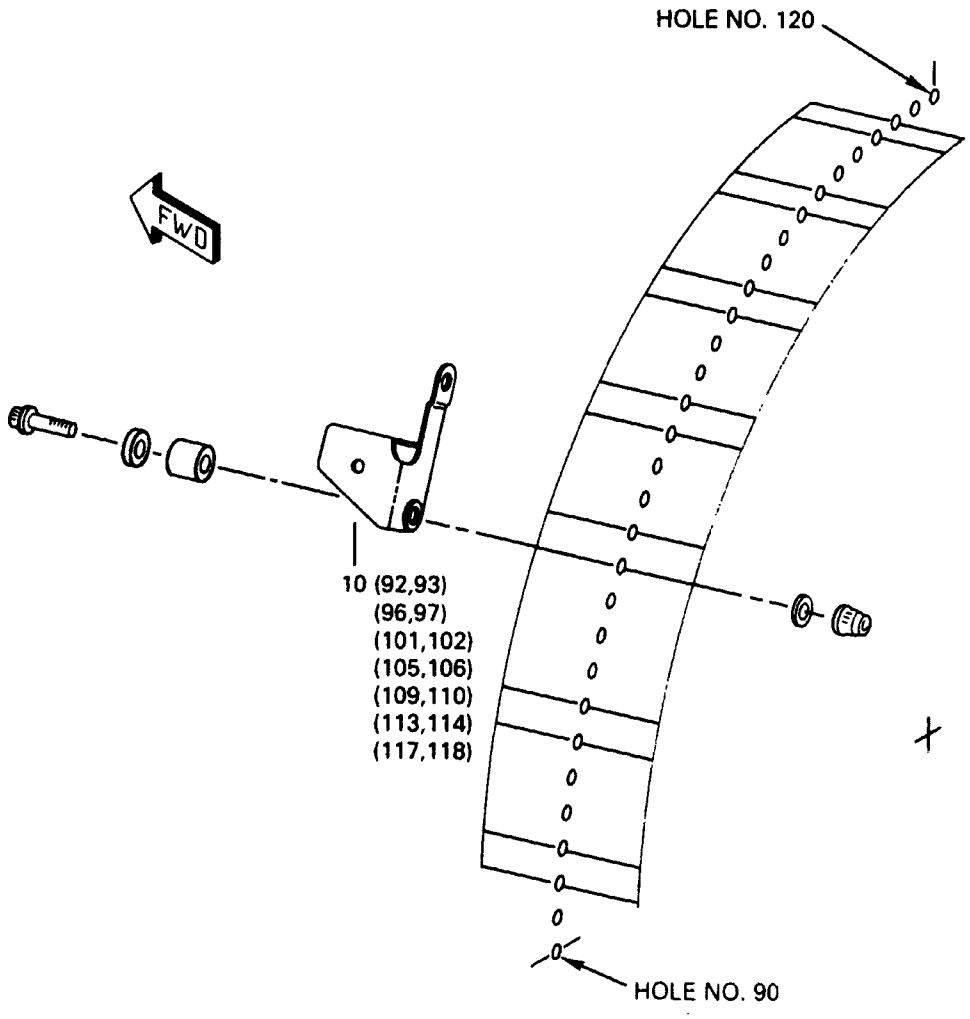
Front Fan Case Flange A Bracket Locations
Figure 410



BM5 72 23 01 4 KJPO - 00

Front Fan Case Handling Bracket
Figure 411



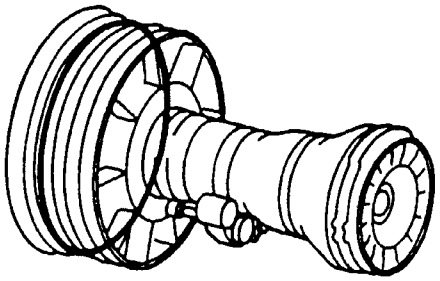


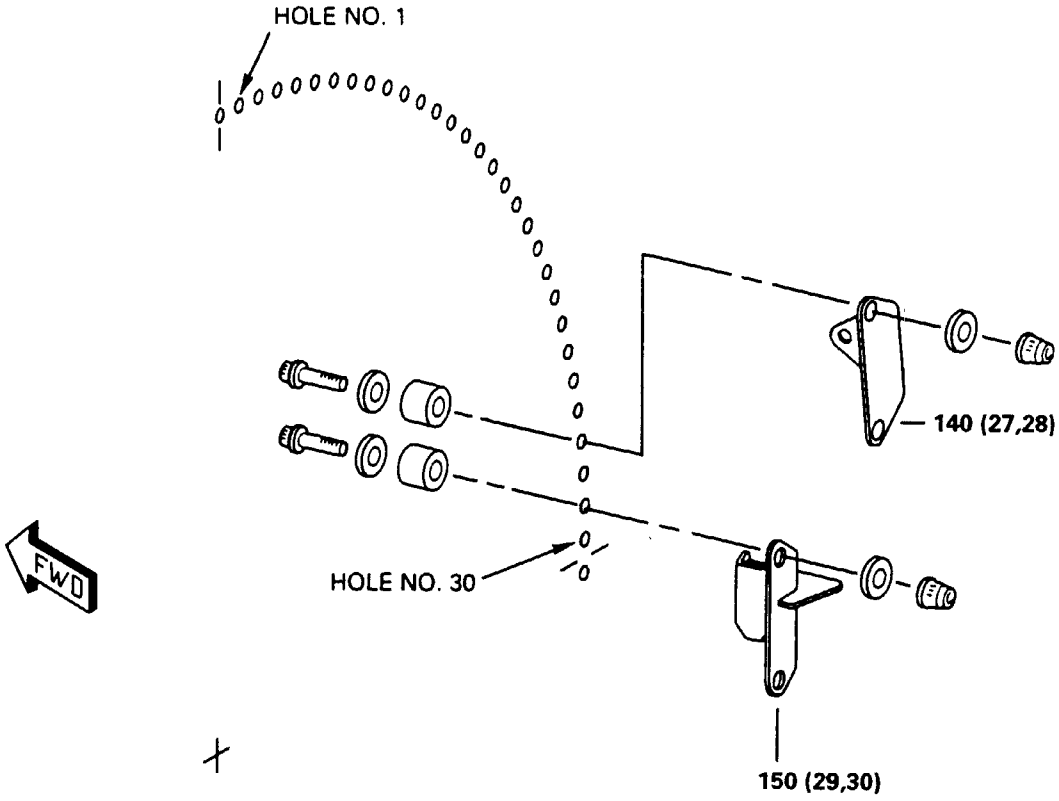
(NUMBERS IN PARENTHESIS REPRESENT BOLTHOLE LOCATIONS)

L-A6480

BM5 72 23 01 4 KLPA - 00

Front Fan Case Flange B Bracket Locations (Sheet 1)
Figure 412



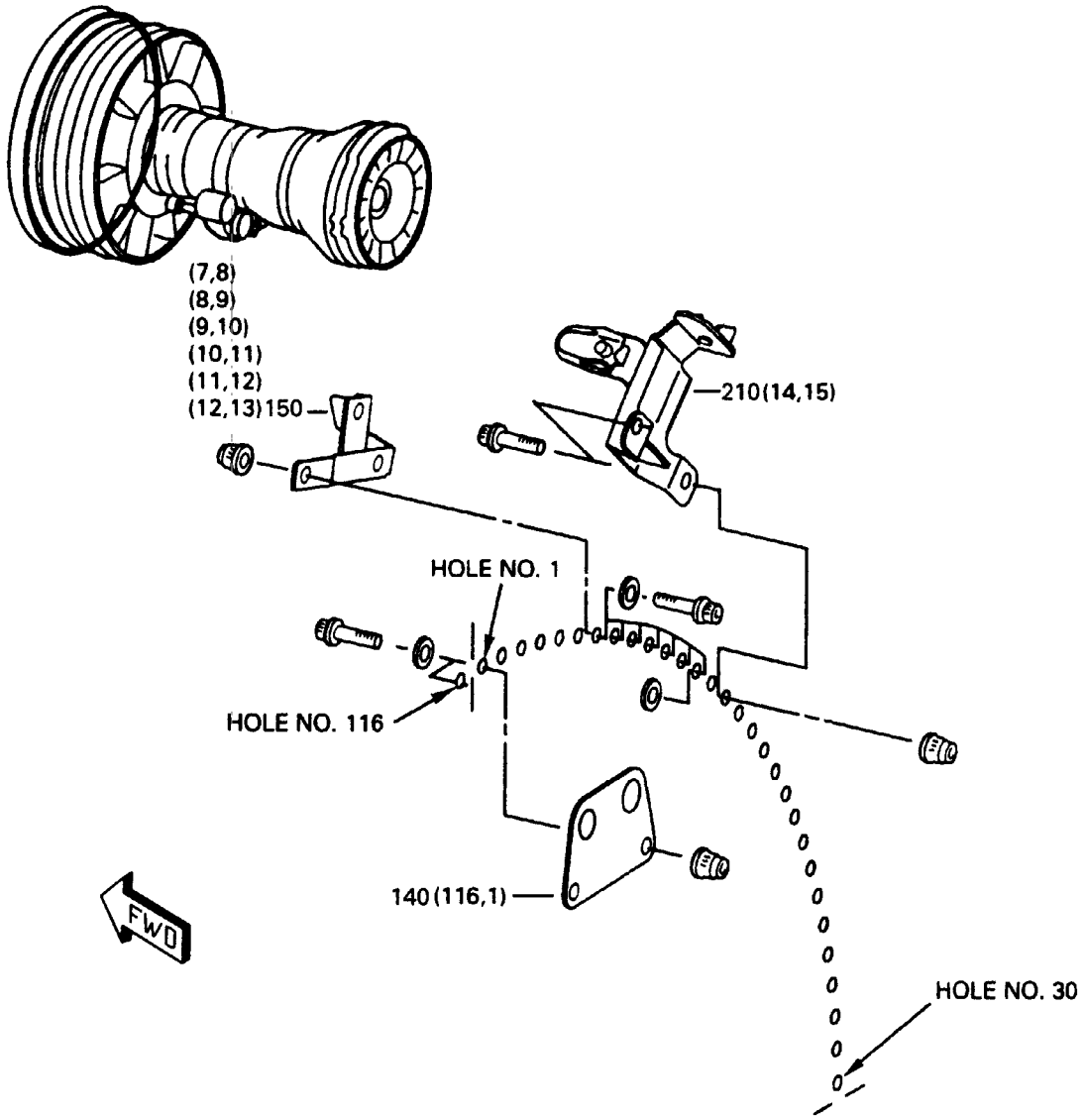


NOTE: FOR ENGINES EQUIPPED WITH SUPPLEMENTAL CONTROL UNIT WITH MULTIPLEXING ONLY.

L-A7399 (0000)

BM5 72 23 01 4 KLPC - 00

Front Fan Case Flange B Bracket Locations (Sheet 2)
Figure 412

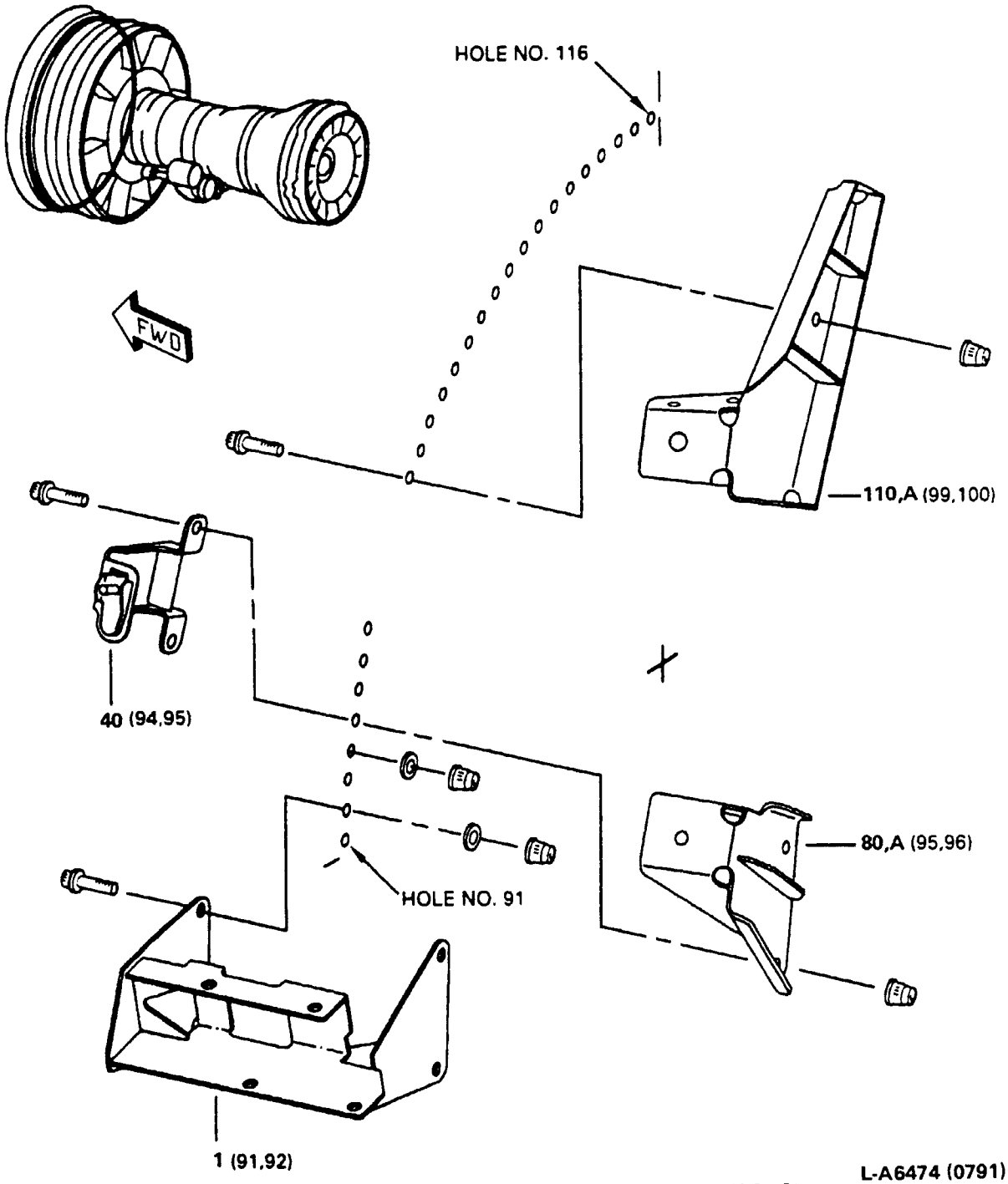


BM5 72 23 01 4 KNPA - 00

(NUMBERS IN PARENTHESIS REPRESENT BOLTHOLE LOCATIONS)

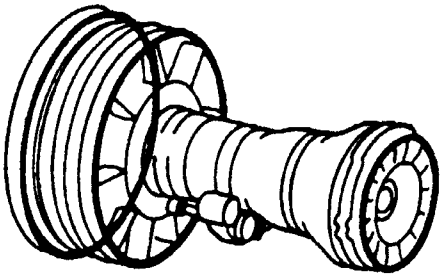
L-A7397 (0000)

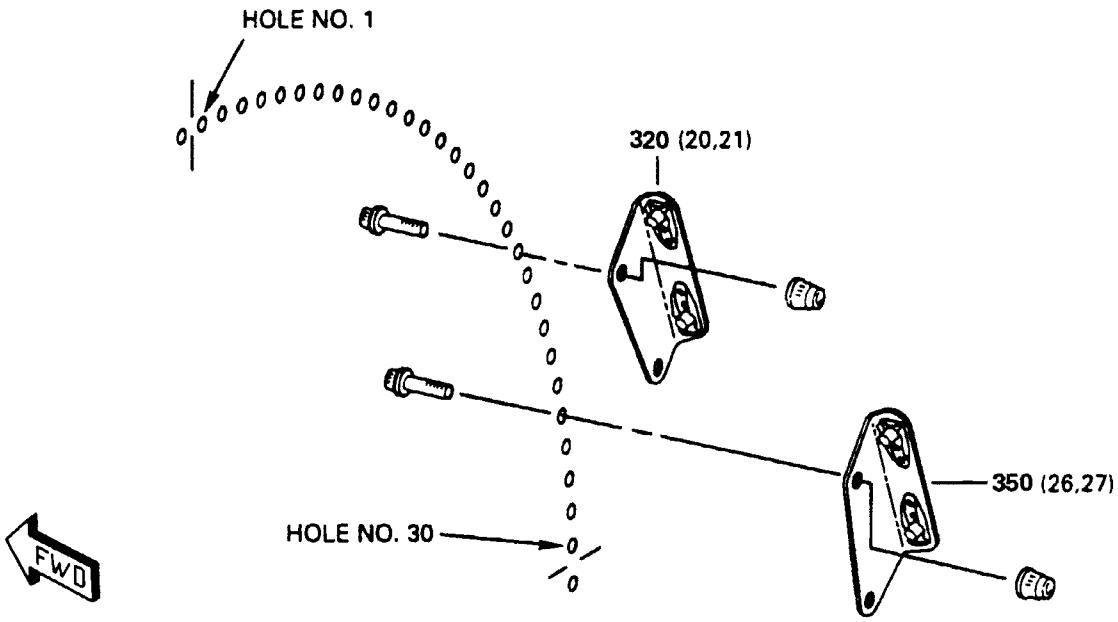
Front Fan Case Flange A1 Bracket Locations (Sheet 1)
Figure 413



(NUMBERS IN PARENTHESIS REPRESENT BOLTHOLE LOCATIONS)

Front Fan Case Flange A1 Bracket Locations (Sheet 2)
Figure 413





NOTE : FOR ENGINES EQUIPPED WITH
SUPPLEMENTAL CONTROL UNIT ONLY.

L-A7373 (0791)

BM5 72 23 01 4 KNPE - 01

Front Fan Case Flange A1 Bracket Locations (Sheet 3)
Figure 413

D. Installation (Ref. Fig. 407, 409, 410)
(Ref. Fig. 411, 412, 413)

(1)If a new case is to be installed, do the following :

(a)Install brackets to Flange A1 and attach with bolts, threads lubricated with Engine Oil (Material No.P03-001), washers and nuts. TORQUE the nuts to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).

(b)If applicable install a vibration pickup bracket to the rear of Flange A at approximately the 1 o'clock position. Attach the bracket with bolts, threads lubricated with Engine Oil (Material No.P03-001). TORQUE the bolts to between 65 and 85 lbf.in. (0.74 and 0.96 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the bolts.

NOTE : The FADEC programming plug lanyard and the FADEC ground cable is attached to the front upper FADEC mount bracket.

(2)Attach a PWA 85677 Handling Bracket to the front flange of the front fan case at the 12 o'clock position. Attach a hoist to the handling bracket.

(3)Lift the fan case from the pallet. Put the front fan case to the case and vane assembly by aligning the dowel pin in the fan case with the dowel pin hole in the case and vane assembly. Carefully hit (tap) the fan case with a fiber mallet to have the case fully against the case and vane assembly.

(4)Use the PWA 87503 Nut Handle and install bolts, threads lubricated with Engine Oil (Material No.P03-001), spacers, washers, brackets and nuts into Flange B. TORQUE the nuts to between 180 and 200 lbf.in. (2.04 and 2.25 m.daN).

(5)Measure the gap between the cases at the ID of Flange B. The gap must be within 0.000 - 0.020 in. (0.000 - 0.508 mm).

(6)Remove the hoist, bracket and adapters from the fan case.

CAUTION : DO NOT USE LUBRICANTS ON THE FADEC SENSING TUBES, ADAPTERS, OR PACKINGS, CONTAMINATION OF THE FADEC CAN RESULT.

(7)Install the FADEC PT2 manifold assembly (AS16) as follows.

(a)Remove the protection covers and install the tee end of the manifold to a bracket between Flanges A1 and B1 located at the 9 o'clock position. Install the opposite end of the manifold to the smaller adapter at the 12 o'clock position and tighten the manifold nut by hand.

(b)Attach the manifold (tee) to the bracket at the 9 o'clock position with a bolt, threads lubricated with Engine Oil (Material No.P03-001) and tighten by hand.

(c)Install seven clamps to the manifold assembly at seven bracket locations on Flange B.

(8)Install the FADEC PT4.95 sensing manifold assembly (AS24).

NOTE : If necessary, loosen the bracket (bridged between flanges B2 and C) to install the tube clamps and tubes AS23 and AS24.

(a)Remove the protection covers and install the tee end of the manifold to a bracket between Flanges A1 and B1 located at the 9 o'clock position. Install the tube nut on the AS05 tube to the manifold coupling at the 10:30 o'clock position and tighten by hand.

(b)Attach the manifold (tee) to the bracket at the 9 o'clock position with a bolt, threads lubricated with Engine Oil (Material No.P03-001) and

tighten by hand.

(c)Attach the manifold to a bracket on Flange B1 at the 9 o'clock position with a clamp and a bolt, threads lubricated with Engine Oil (Material No.P03-001). Tighten the bolt by hand.

(d)Install a clamp to the manifold at a bracket location (bridged) between Flanges B2 and C at the 9:30 o'clock position (bolt is installed with the fan case harnesses).

(e)Install three clamps to the manifold assembly at three bracket locations between Flanges B2 and C.

(9)Install the FADEC PAM manifold assembly (AS17) as follows.

(a)Remove the protection covers and install the tee end of the manifold to a bracket between Flanges A1 and B1 located at the 9 o'clock position. Install the opposite end of the manifold to the adapter at the 12 o'clock position and tighten the manifold nut by hand.

(b)Attach the manifold (tee) to the bracket at the 9 o'clock position with a bolt, threads lubricated with Engine Oil (Material No.P03-001) and tighten by hand.

(c)Install seven clamps to the manifold assembly at seven bracket locations on Flange B.

(d)Attach the seven clamps on the FADEC PT2 manifold (AS16) and the seven clamps on the FADEC PAM manifold (AS17) to the brackets on Flange B with bolts, threads lubricated with Engine Oil (Material No.P03-001). TORQUE the bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(e)TORQUE the bolt that attaches the manifold tee to the bracket at the 9 o'clock position to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).

(f)TORQUE the manifold nut to the adapter at the 12 o'clock position to between 270 and 300 lbf.in. (3.06 and 3.38 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the manifold nut.

(10)Torque the FADEC PT2 manifold assembly (AS16) as follows.

(a)TORQUE the bolt that attaches the manifold tee to the bracket at the 9 o'clock position to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).

(b)TORQUE the manifold nut to the adapter at the 12 o'clock position to between 135 and 150 lbf.in. (1.53 and 1.69 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the manifold nut.

(11)Install the FADEC PB manifold assembly (AS23) as follows.

(a)Remove the protection covers and install the tee end of the manifold to a bracket between Flanges A1 and B1 located at the 9 o'clock position. Install the tube nut on the AS19 tube to the manifold coupling at the 10:30 o'clock position and tighten by hand.

(b)Attach the manifold (tee) to the bracket at the 9 o'clock position with a bolt, threads lubricated with Engine Oil (Material No.P03-001) and tighten by hand.

(c)Attach the manifold to a bracket on Flange B1 at the 9 o'clock position with a clamp and a bolt, threads lubricated with Engine Oil (Material No.P03-001). Tighten the bolt by hand.

(d)Install a clamp to the manifold at a bracket location (bridged) between Flanges B2 and C at the 9:30 o'clock position. Attach the clamps on the AS23 and AS24 manifolds, and the W1 harness to the bracket with a bolt, threads lubricated with Engine Oil (Material No.P03-001) and nut.

TORQUE the bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
NOTE : If the bracket (bridged between flanges B2 and C) has been loosened for installation of the tube clamps and tubes AS23 and AS24, do as follows :
TORQUE again the nuts that attach the bracket to the flanges to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).

(e) Install three clamps to the manifold assembly at three bracket locations between Flanges B2 and C.

(f) Attach the three clamps on the PT4.95 sensing manifold (AS24) and the three clamps on the EEC PB manifold (AS23) to the three brackets located between Flanges B2 and C with nuts, threads lubricated with Engine Oil (Material No.P03-001). TORQUE the nuts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(12) TORQUE the two bolts that attach the clamp on the PB sensing manifold (AS23) and the clamp on the PT4.95 sensing manifold (AS24) to the bracket on Flange B1 at the 9 o'clock position to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(13) TORQUE the bolts that attach the tee of the FADEC PB manifold (AS23) and the tee of the PT4.95 sensing manifold (AS24) to the bracket (bridged) between Flanges A1 and B1 at the 9 o'clock position to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).

(14) TORQUE the tube nut on the AS05 tube to the coupling on the AS24 manifold at the 10:30 o'clock position located between Flanges B2 and C to between 150 and 175 lbf.in. (1.70 and 1.97 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the tube nut.

(15) TORQUE the tube nut on the AS19 tube to the coupling on the AS23 manifold at the 10:30 o'clock position located between Flanges B2 and C to between 90 and 100 lbf.in. (1.02 and 1.12 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the tube nut.

(16) Install the PB flex hose assembly (AS12) to the FADEC PB manifold assembly (AS23) as follows.

(a) Remove the protection covers and install the flex hose to the tee of the AS23 manifold located on a bracket (bridged) between Flanges A1 and B1 at the 9 o'clock position.

(b) TORQUE the flex hose nut to between 270 and 300 lbf.in. (3.06 and 3.38 m.daN).

(c) If the hose nuts have lockwire holes, install the Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the hose nuts.

(17) Install the PT4.95 flex hose assembly (AS13) to the PT4.95 sensing manifold (AS24) as follows.

(a) Remove the protection covers and install the flex hose to the tee of the AS24 manifold located on a bracket (bridged) between Flanges A1 and B1 at the 9 o'clock position.

(b) TORQUE the flex hose nut to between 450 and 500 lbf.in. (5.09 and 5.64 m.daN).

(c) If the hose nuts have lockwire holes, install the Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the hose nuts.

(18)Install the PAM flex hose assembly (AS10) to the FADEC PAM manifold (AS17) as follows.
   (a)Remove the protection covers and install the flex hose to the tee of the AS17 manifold located on a bracket (bridged) between Flanges A1 and B1 at the 9 o'clock position.
   (b)TORQUE the flex hose nut to between 135 and 150 lbf.in. (1.53 and 1.69 m.daN).
   (c)If the hose nuts have lockwire holes, install the Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the hose nuts.
(19)Install the PT2 flex hose assembly (AS11) to the EEC PT2 manifold (AS16) as follows.
   (a)Remove the protection covers and install the flex hose to the tee of the AS16 manifold located on a bracket (bridged) between Flanges A1 and B1 at the 9 o'clock position.
   (b)TORQUE the flex hose nut to between 90 and 100 lbf.in. (1.02 and 1.12 m.daN).
   (c)If the hose nuts have lockwire holes, install the Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the hose nuts.

   CAUTION : DO NOT USE LUBRICANTS ON THE SCU SENSING TUBES, ADAPTERS, OR PACKING. CONTAMINATION OF THE SCU CAN RESULT.

(20)For engines equipped with a supplemetal control unit (SCU) with multiplexing, install the PT2.5 sensing manifold assembly (AS36) and the PT2.5 sensing hose (AS38).
   (Ref. Fig. 408)

   NOTE : The programming plug is (stayed) attached to the rear of the lower SCU mount bracket.

   (a)Remove the protection covers and install the coupling end of the AS36 manifold to the AS28 tube assembly. Tighten the tube nut by hand. Install the tee end of the manifold to the bracket on Flange B with a bolt, threads lubricated with Engine Oil (Material No.P03-001) and tighten by hand.
   (b)Attach the manifold to two brackets on Flange C with clamps, bolts, threads lubricated with Engine Oil (Material No.P03-001) and nuts.
   (c)Attach the manifold to the bracket on Flange B2 with a clamp, bolt, threads lubricated with Engine Oil (Material No.P03-001) and a nut.
   (d)Attach the manifold to the bracket on Flange B with a clamp, bolt, threads lubricated with Engine Oil (Material No.P03-001) and a nut.
   (e)TORQUE the four bolts that attach the AS36 manifold to brackets on Flange B, B2 and C to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
   (f)TORQUE the tube nut on the AS28 tube assembly to the coupling on the AS36 manifold at the 2 o'clock position to between 135 and 150 lbf.in. (1.53 and 1.69 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the tube nut.
   (g)TORQUE the bolt that attaches the tee end of the AS36 manifold to a bracket on Flange B to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).
   (h)Remove the protection covers and install the hose assembly (AS38) to the tee of the AS36 manifold. Tighten the tube nut on the hose by hand.
   (i)TORQUE the hose assembly nut to the manifold tee to between 90 and

100 lbf.in. (1.02 and 1.12 m.daN).

(j)If the hose nuts have lockwire holes, install the Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to safety the hose nuts.

(21)For engines equipped with a supplemental control unit (SCU), install the ground cable as follows (Ref. Fig. 408) (Sheet 4/4).

(a)Install the SCU ground cable on the rearward side of Flange B1 at the location where the upper SCU mount bracket is attached to the flange. Attach the cable with a bolt, threads lubricated with Engine Oil (Material No.P03-001) a washer and a nut. TORQUE the bolt to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).

(22)Attach the W11 harness to the brackets on Flange A1 at approximately the 1 o'clock position with clamps and bolts, threads lubricated with Engine Oil (Material No.P03-001). TORQUE the bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(23)Attach the W2 harness to a bracket on Flange A1 at the 9:30 o'clock position with a clanp and nut, threads lubricated with Engine Oil (Material No.P03-001). TORQUE the nut to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN) (Ref. Fig. 409) (Sheet 2/2).

(24)For engines equipped with a supplemental control unit (SCU) and are post SB PW4ENG 73-137, install the insulation blankets on the PB sense tubes as follows :
(Ref. Fig. 414)

(a)Cut a slit to open the insulation blanket. Trim the length of the blanket sufficiently to be installed between each tube clamp and tube connector.

(b)Install the insulation blankets (PN 58T354 and 58T355) around the EEC PB sensing tube (AS19) and the EEC PB manifold (AS23) between each clamp.

(c)Wrap the lacing tape at each 0.75 - 1.00 in. (19.050 - 25.400 mm) along the blanket.

(d)Install the insulation blanket (PN 58T357) around the tube connections and over the ends of the insulation blankets (PN 58T354 and 58T355).

(e)Wrap the lacing tape at each 0.75 - 1.00 in. (19.050 - 25.400 mm) along the blanket.

NOTE : Longitudinal bulges and open distances between the tie points on the insulation blanket is permitted. Longitudinal overlap between the insulation blankets is only permitted where shown in the figure.

NOTE : The insulation blanket can touch the fan case, other tubes, and brackets.

E. Close-Up

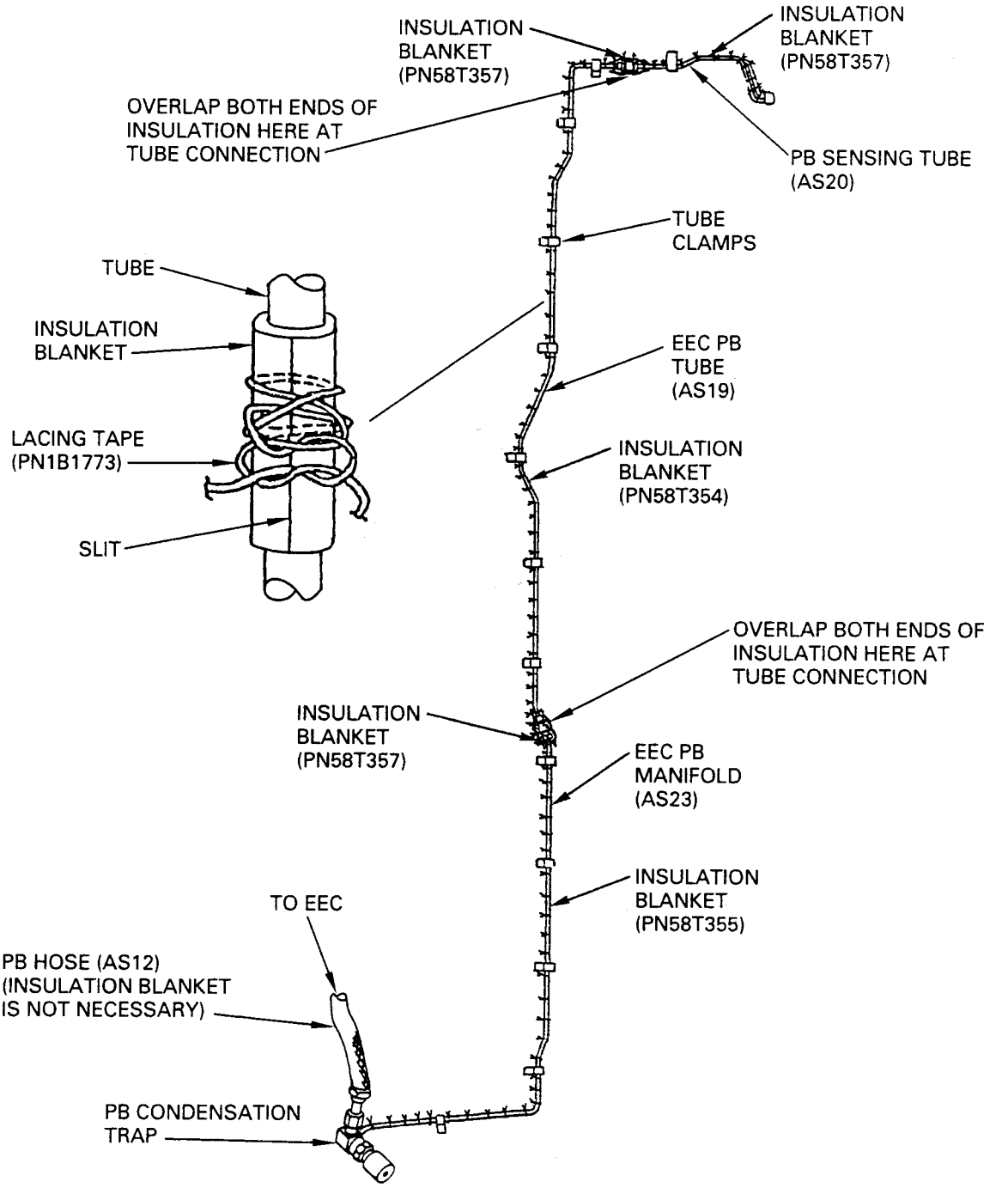
(1)Install FADEC (Ref. 73-21-01, P. Block 401).

(2)Install SCU (Ref. 73-21-15, P. Block 401).

(3)Install first stage compressor rotor (fan) blades assembly (Ref. 72-21-02, P. Block 401).

(4)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

(5)Test engine per test reference table (Ref. 71-00-00, P. Block 501).



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PB Sense Tube Insulation Blanket
For the Front Fan Case (Post SB PW4ENG 73-137)
Figure 414

FAN CASE ASSEMBLY - INSPECTION/CHECK

1. Inspect Fan Case Duct Segments (Rubstrips)

A. Equipment and Materials

ITEM	DESIGNATION
1.	Circuit Breaker Safety Clips
2. PWA29156	Gage
Referenced Procedure - 72-23-01, P. Block 801	Fan Case Assembly

B. Procedure

(1) Examine the ribs of the interrupted continuous groove (ICG) rubstrip on the duct segments for wear. To know the quantity of wear to the ribs on the duct segments, do as follows.

(a) Measure the depth of the grooves with a gage. Use either a standard dial indicator depth gage with a tapered contact point or PWA29156 gage. Make sure that the groove is not plugged. Make sure that the point of the gage touches the bottom of the groove.

NOTE : Because the bottoms of the grooves are rounded, it is possible that several readings at the same position are necessary to find the deepest point.

1 To use PWA29156 Gage, put the gage body with the contact point in the setting master on the surface marked 0.260 in. (6.604 mm). Set the revolution counter, dial indicator, and bezel to zero. Subtract the measurement from 0.260 in. (6.604 mm). The result of the calculation is the groove depth.

NOTE : If you use a standard depth gage, a calculation is not necessary to know the groove depth. The reading on the gage is the groove depth.

(b) Take a measurement at each of eight positions shown in (Ref. Fig. 601) and Table 601. Put the gage in the third groove from the front (large OD) of the fan case. Write the reading at each position.

(c) Calculate the average of the readings for the three positions that are in Group A. Do the same for the three positions that are in each of the other groups (B through F). The average for each group must not be less than 0.140 in. (3.556 mm).

	Positions of Gage Readings		Positions of Gage Readings
Group A	7, 8, 1	Group D	3, 4, 5
Group B	8, 1, 2	Group E	4, 5, 6
Group C	1, 2, 3	Group F	5, 6, 7

Locations of the Gage Readings

Table 601

(d)If a fan case is not in the limits, remove the fan case.

(2)Examine the duct segments as follows to know if they are bonded to the case. A duct segment that is not bonded is not permitted.

(a)With your finger, press the duct segment in the area where you think there is no bond. Examine the segment carefully to see if there is any movement in the rubstrip.

(b)With the plastic end of a screwdriver or simular tool, hit the rubstrip lightly all around. Listen to the sound.
If the sound is a clear ring, the rubstrip is well bonded.
If the sound is a dull thud (has low resonance), the rubstrip is not bonded.

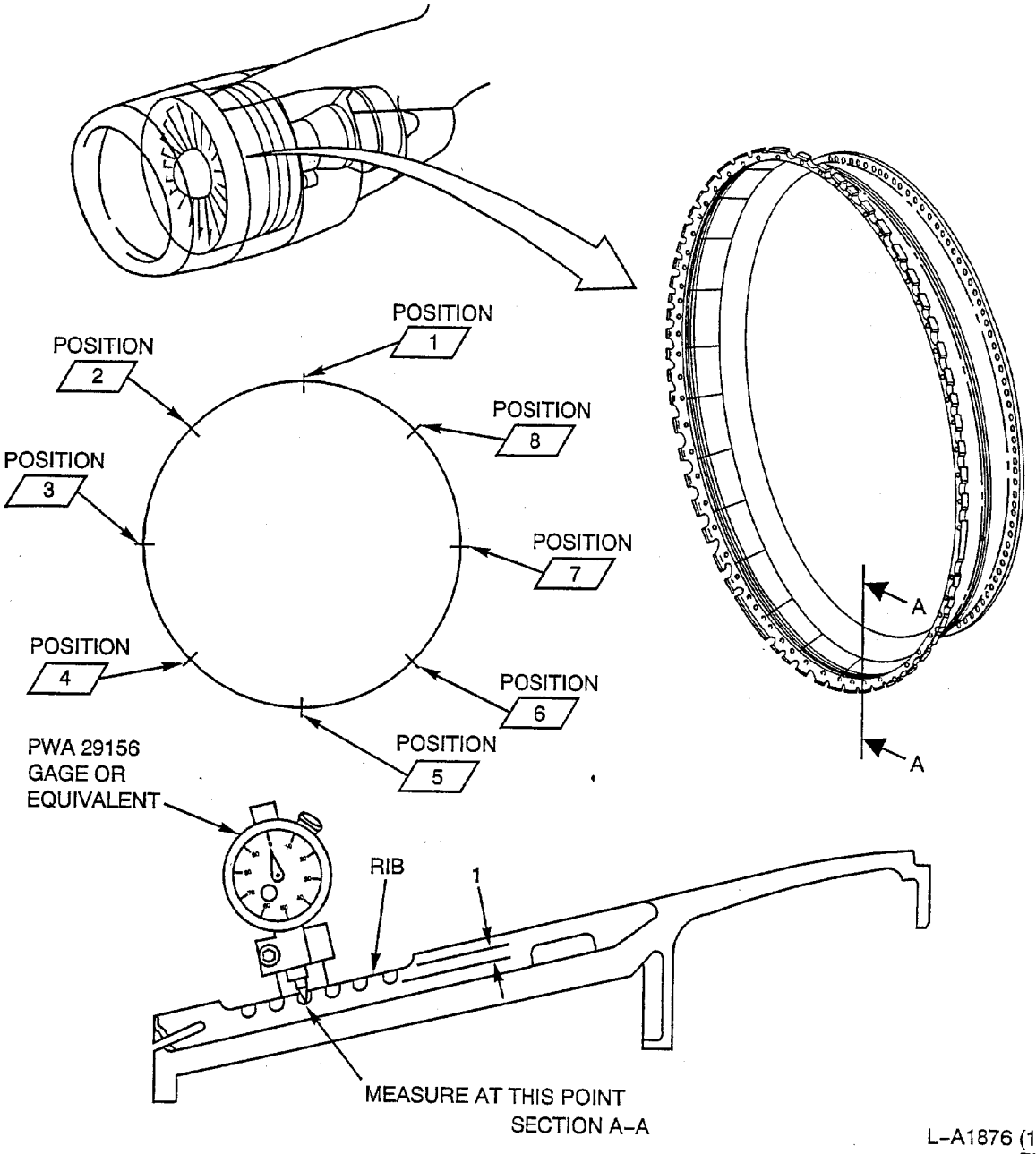
(3)Duct segment inspection (for rib damage, cracks and holes)

NOTE : There is a 60 hour continue-in-service limit for segments that are not serviceable BUT the percentage of such segments is 50 percent, maximum.

Inspect	Serviceable Limits	Repairable Limits	Repairs
Not there			Ref. 72-23-01, P. Block 801
Total for any one rib, each segment	3.0 in. (76.200 mm) circumferentially maximum	6.0 in. (152.400 mm) circumferentially maximum	
Total for any one rib, all segments	10.0 in. (254.000 mm) circumferentially maximum	15 in. (381.000 mm) circumferentially maximum	
Distance from an area on an adjacent rib where there is no rib	6.0 in. (152.400 mm) minimum		
Cracks			Ref. 72-23-01, P. Block 801
Width	0.015 in. (0.381 mm) maximum	0.125 in. (3.175 mm) maximum	
Distance (from another crack) Length of an axial crack	4.0 in. (101.600 mm) minimum		
If the crack	No limit		

Inspect	Serviceable Limits	Repairable Limits	Repairs
is within 0.250 in. (6.350 mm) of the axial edge of the segment			
If the crack is else where	4.0 in. (101.600 mm) maximum		
Holes			Ref. 72-23-01, P. Block 801
Dimension at widest point	0.125 in. (3.175 mm) maximum	6 in. (152.400 mm) maximum	
Depth	0.125 in. (3.175 mm)	No limit	

Duct Segment Inspection
(Rib Damage, Cracks and Holes)
Table 602



L-A1876 (1205)
PW V

1. 0.140 IN (3.556MM) MINIMAL DEPTH, AVERAGE OVER SPECIFIED POSITIONS.

BM5 72 23 01 6 KAM0 02

Fan Case Duct Segment Wear
Figure 601

R

1. Repair Large Holes In the Duct Segment

A. Equipment and Materials

ITEM	DESIGNATION
(1)Material No.P05-004	Special Materials (Ref. 70-00-00)
(2)Material No.P05-038	Special Materials (Ref. 70-00-00)
(3)Material No.P08-021	Bonding and Adhesive Compounds (Ref. 70-00-00)

Referenced Procedures

- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-13-00, P. Block 301	Cowl Doors
- 72-21-02, P. Block 401	First Stage Compressor (Fan) Blade Assembly

B. Job Set-Up

(1)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove the stage 1 LPC (fan) blades (Ref. 72-21-02, P. Block 401).

C. Procedure (Ref. Fig. 801)

Characteristics	Area A	Area B	Area C
Total arc length, each segment	6 in. (152.4 mm) maximum	6 in. (152.4 mm) maximum	6 in. (152.4 mm) maximum
Total arc length, all segments		15 in. (381.0 mm) maximum	
Circumferential separation between incidents		12 in. (304.80 mm) minimum	
Diameter	0.125 in. (3.175 mm) minimum	0.125 in. (3.175 mm) minimum	0.125 in. (3.175 mm) minimum
Material removal necessary all around the damage (See NOTE)	0.5 in. (12.7 mm)	0.5 in. (12.7 mm)	0.5 in. (12.7 mm)
Retention pin visible			Not repairable

Repair Limits
Table 801

Characteristics	Area A	Area B	Area C

NOTE : For damage that is in a pocket, remove the full cracked area.
CAUTION : DO NOT CUT THE SEGMENT THAT IS ADJACENT TO THE DAMAGED SEGMENT. DO NOT TOUCH THE FAN CASE WITH THE TOOL THAT CUTS.

(1)Remove the damage with a tool. Do not go through the duct segment unless the damage is in a pocket.

WARNING : WHEN YOU USE SOLVENTS, USE COTTON GLOVES UNDER PLASTIC GLOVES THAT YOU CAN DISCARD.

(2)Clean the repair area.
  (a)With a SPOP 208 solvent (Ref. 70-00-00, P. Block 201) in a soft bottle, apply solvent to the repair area.
  (b)Make wet a piece of clean cheesecloth Material No.P05-038 with a SPOP 208 solvent (Ref. 70-00-00, P. Block 201).
  (c)Wipe the repair area with the cheesecloth.
  (d)Air dry the repair area for 10 minutes.
(3)Apply compound Material No.P08-021.
  (a)In a clean cup, mix 1.0 gram Part A with 0.09 gram Part B. Stir the mixture for two minutes.
    NOTE : Discard the mixture after 30 minutes.
  (b)Use a clean dry tool to apply the compound to the repair area. If the damage is a hole in one of the pockets, push in a quantity of compound sufficient to support the patch.
  (c)If necessary to keep the compound in position, use a layer of Material No.P05-004.
  (d)Dry the compound for three hours at room temperature before you touch it or before operation of the engine. To fully dry the compound at room temperature, 24 hours are necessary.
  (e)Instead of a cure at room temperature, it is permitted to heat the repair area to 250°F (121.1°C) for two hours.
  (f)Remove the tape.
(4)Smooth the repair area to make the surface continuous with to 0.015 in. (0.381 mm) above, the adjacent surface.
(5)If the repair is in Area B, it is not necessary to repair the grooves.

D. Close-Up
(1)Install the stage 1 LPC (fan) blades (Ref. 72-21-02, P. Block 401).
(2)Close thrust reverser and fan cowl doors, and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

2. Repair Duct Segment Cracks

A. Equipment and Materials

ITEM	DESIGNATION
(1)Material No.P05-004	Special Materials (Ref. 70-00-00)
(2)Material No.P05-038	Special Materials (Ref. 70-00-00)

ITEM	DESIGNATION
(3)Material No.P08-021	Bonding and Adhesive Compounds (Ref. 70-00-00)

Referenced Procedures

- 70-00-00, P. Block 201 — Engine - Standard Practices
- 71-13-00, P. Block 301 — Cowl Doors
- 72-21-02, P. Block 401 — First Stage Compressor (Fan) Blade Assembly

B. Job Set-Up

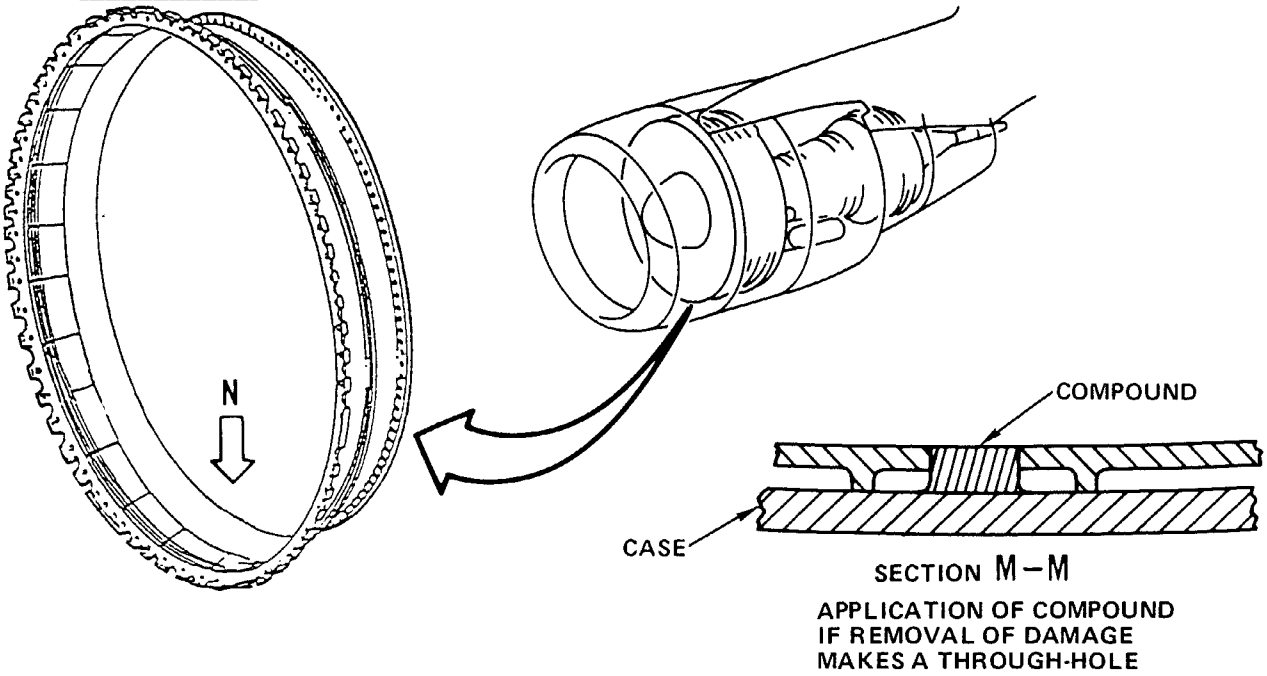
(1)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

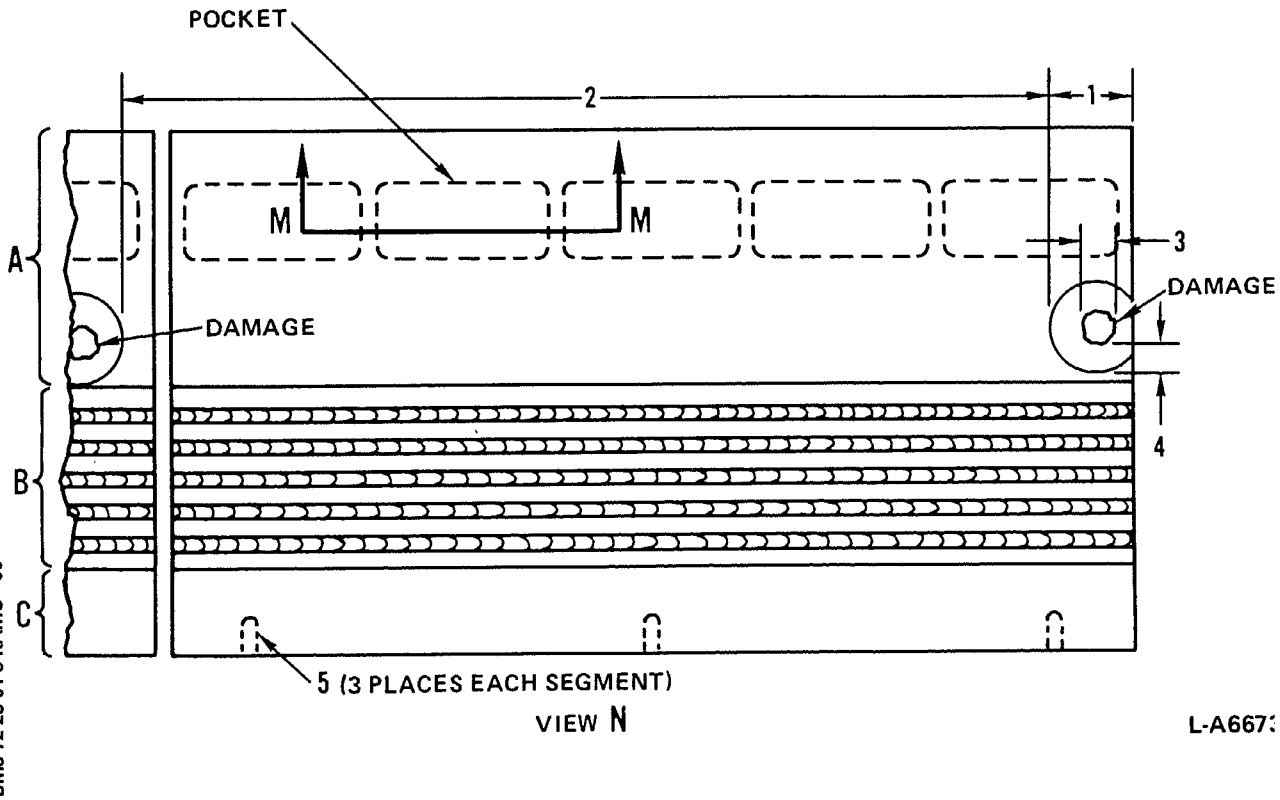
(2)Remove the stage 1 LPC (fan) blades (Ref. 72-21-02, P. Block 401).

C. Procedure (Ref. Fig. 802)

Characteristics	Area A	Area B	Area C
Crack width	0.125 in. (3.175 mm) maximum	0.125 in. (3.175 mm) maximum	0.125 in. (3.175 mm) maximum
Height of compound	Continuous with, to 0.015 in. (0.381 mm) above R	Continuous with, to 0.015 in. (0.381 mm) above R	Continuous with, to 0.015 in. (0.381 mm) above R
Depth of material removal	0.10 in. (2.54 mm) maximum	0.10 in. (2.54 mm) maximum	0.10 in. (2.54 mm) maximum
Total arc length, each segment	6 in. (152.4 mm) maximum	6 in. (152.4 mm) maximum	6 in. (152.4 mm) maximum
Total arc length, all segments		15 in. (381.00 mm) maximum	
Circumferential separation between incidents		12 in. (304.80 mm) minimum	
Retention pin visible			Not repairable

Repair Limits
Table 802





Repair Limits for Large Holes in the Duct Segment
Figure 801

CAUTION : DO NOT CUT THE SEGMENT THAT IS ADJACENT TO THE DAMAGED SEGMENT. DO NOT TOUCH THE FAN CASE WITH THE TOOL THAT CUTS.

(1)With a tool, remove material from the crack to make a groove with the dimensions in the referenced figure.

WARNING : WHEN YOU USE SOLVENTS, USE COTTON GLOVES UNDER PLASTIC GLOVES THAT YOU CAN DISCARD.

(2)Clean the repair area.

(a)With a SPOP 208 solvent (Ref. 70-00-00, P. Block 201) in a soft bottle, apply solvent to the repair area.

(b)Make wet a piece of clean cheesecloth Material No.P05-038 with a SPOP 208 solvent (Ref. 70-00-00, P. Block 201).

(c)Wipe the repair area with the cheesecloth.

(d)Air dry the repair area for 10 minutes.

(3)Apply Material No.P08-021.

(a)In a clean cup, mix 1.0 gram Part A with 0.09 gram Part B. Stir the mixture for two minutes.

NOTE : Discard the mixture after 30 minutes.

(b)Use a clean dry tool to apply the compound to the repair area.

(c)If necessary to keep the compound in position, use a layer of Material No.P05-004.

(d)Dry the compound for three hours at room temperature before you touch it or before operation of the engine. To fully dry the compound at room temperature, 24 hours are necessary.

(e)Instead of a cure at room temperature, it is permitted to heat the repair area to 250°F (121.1°C) for two hours.

(f)Remove the tape.

(4)Smooth the repair area.

(5)If the repair is in Area B, it is not necessary to repair the grooves.

D. Close-Up

(1)Install the stage 1 LPC (fan) blades (Ref. 72-21-02, P. Block 401).

(2)Close thrust reverser and fan cowl doors, and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

3. Repair Duct Segment Surface Damage with Potting Compound

A. Equipment and Materials

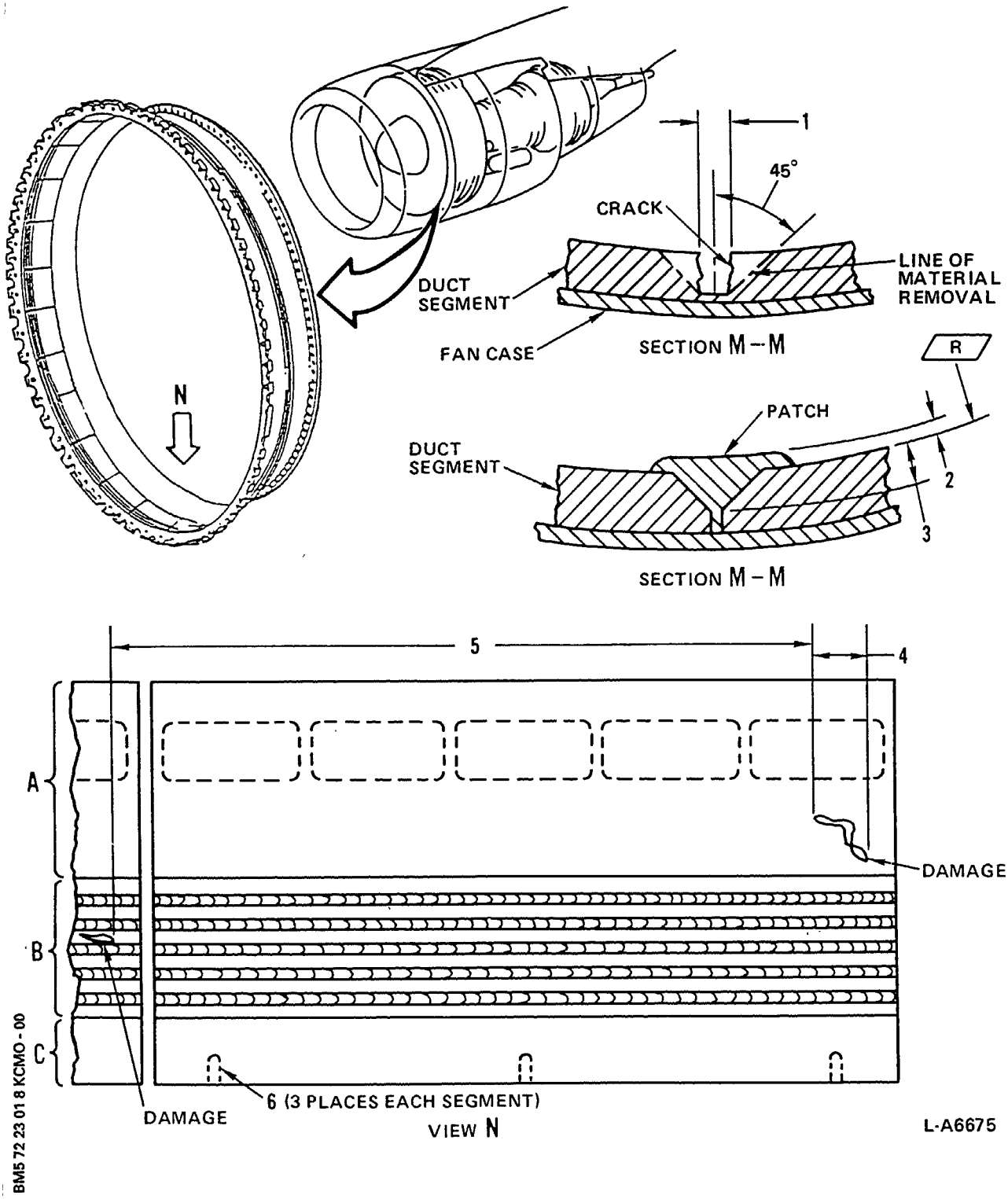
ITEM	DESIGNATION
(1)Material No.P05-004	Special Materials (Ref. 70-00-00)
(2)Material No.P05-038	Special Materials (Ref. 70-00-00)
(3)Material No.P08-021	Bonding and Adhesive Compounds (Ref. 70-00-00)

Referenced Procedures

- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-13-00, P. Block 301	Cowl Doors
- 72-21-02, P. Block 401	First Stage Compressor (Fan) Blade Assembly

B. Job Set-Up

(1)Open, safety and tag circuit breakers for the appropriate engine and open



Repair Limits for Duct Segment Cracks
Figure 802

fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove the stage 1 LPC (fan) blades (Ref. 72-21-02, P. Block 401).

C. Procedure (Ref. Fig. 803)
CAUTION : DO NOT USE THIS REPAIR IF YOU CAN SEE THE METAL OF THE FAN CASE.

Characteristics	Area A	Area B	Area C
Height of compound	Even with, to 0.015 in. (0.381 mm) above R	Even with, to 0.015 in. (0.381 mm) above R	Even with, to 0.015 in. (0.381 mm) above R
Total arc length, each segment	6 in. (152.00 mm) maximum	6 in. (152.00 mm) maximum	6 in. (152.00 mm) maximum
Total arc length, all segments		15 in. (381.00 mm) maximum	
Circumferential separation between incidents		12 in. (304.80 mm) minimum	
Retention pin visible			Not repairable

Repair Limits
Table 803

CAUTION : DO NOT CUT THE SEGMENT THAT IS ADJACENT TO THE DAMAGED SEGMENT. DO NOT TOUCH THE FAN CASE WITH THE TOOL THAT CUTS.
(1)Remove any loose or cracked material around the damage.
(2)Lightly make rough the damaged area. Remove any layer of dirt on the surface.
WARNING : WHEN YOU USE SOLVENTS, USE COTTON GLOVES UNDER PLASTIC GLOVES THAT YOU CAN DISCARD.
(3)Clean the repair area.
(a)With a SPOP 208 solvent (Ref. 70-00-00, P. Block 201) in a soft bottle, apply solvent to the repair area.
(b)Make wet a piece of clean cheesecloth Material No.P05-038 with a SPOP 208 solvent (Ref. 70-00-00, P. Block 201).
(c)Wipe the repair area with the cheesecloth.
(d)Air dry the repair area for 10 minutes.
(e)Do the above steps until the surface is clean and has no oil.
(4)Apply Material No.P08-021.
(a)In a clean cup, mix 1.0 gram Part A with 0.09 gram Part B. Stir the mixture for two minutes.
NOTE : Discard the mixture after 30 minutes.

(b)Use a clean dry towel to apply the compound to the repair area.
(c)If necessary to keep the compound in position, use a layer of Material No.P05-006.
(d)Dry the compound for three hours at room temperature before you touch it or before operation of the engine. To fully dry the compound at room temperature, 24 hours are necessary.
(e)Instead of a cure at room temperature, it is permitted to heat the repair area to 250°F (121.1°C) for two hours.
(f)Remove the tape.
(5)Make the repair area smooth.
(6)If the repair is in Area B, it is not necessary to repair the grooves.

D. Close-Up
(1)Install the stage 1 LPC (fan) blades (Ref. 72-21-02, P. Block 401).
(2)Close thrust reverser and fan cowl doors, and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

4. Repair Duct Segment Surface Damage with Dent Filler

A. Equipment and Materials

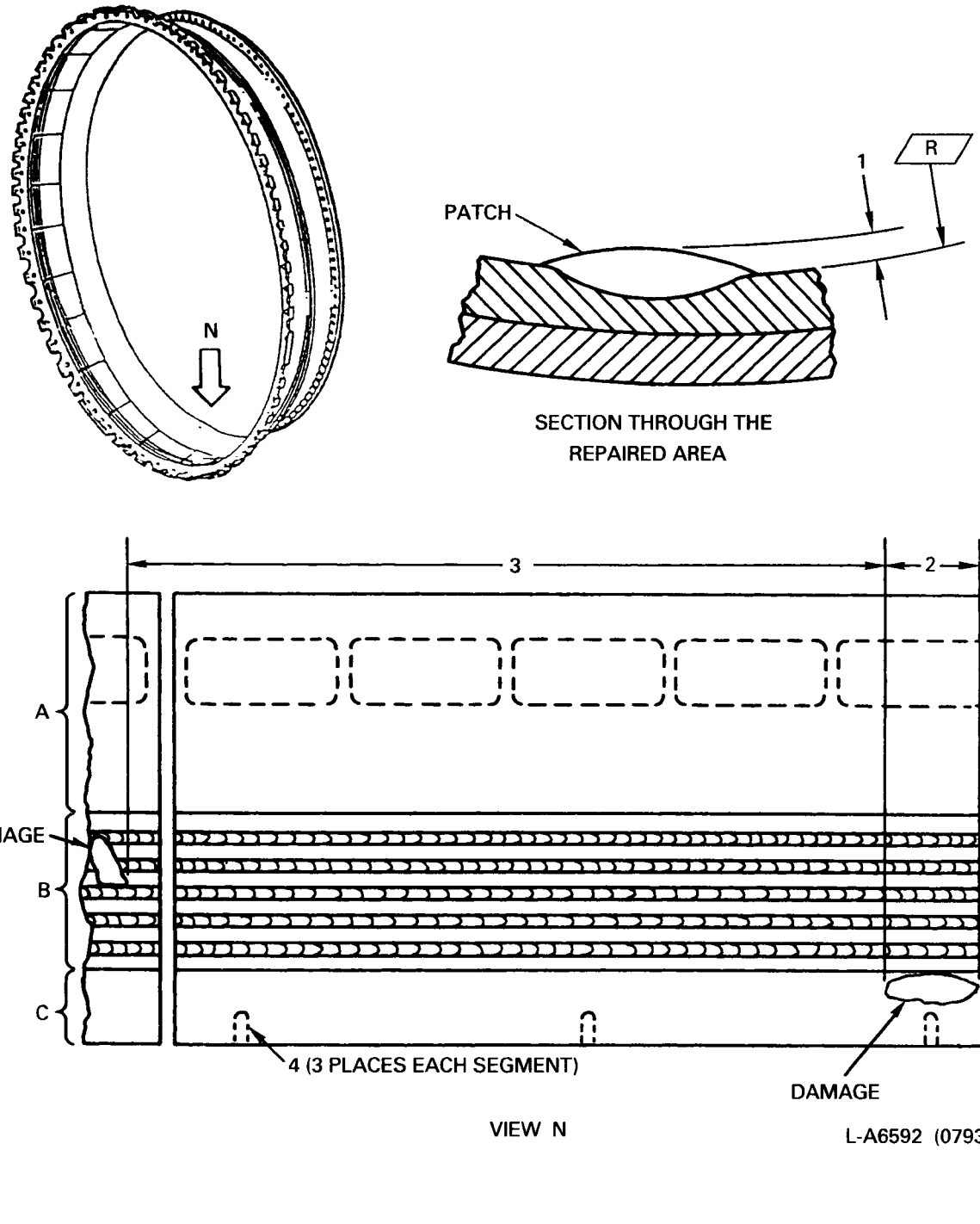
ITEM	DESIGNATION
(1)Material No.P05-038	Special Materials (Ref. 70-00-00)
(2)Material No.P05-221	Special Materials (Ref. 70-00-00)

Referenced Procedures

- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-13-00, P. Block 301	Cowl Doors
- 72-21-02, P. Block 401	First Stage Compressor (Fan) Blade Assembly

B. Job Set-Up
(1)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove the stage 1 LPC (fan) blades (Ref. 72-21-02, P. Block 401).

C. Procedure (Ref. Fig. 803)
CAUTION : DO NOT USE THIS REPAIR IF YOU CAN SEE THE METAL OF THE FAN CASE.
(1)Refer to table 803 for repair limits.
CAUTION : DO NOT CUT THE SEGMENT THAT IS ADJACENT TO THE DAMAGED SEGMENT. DO NOT TOUCH THE FAN CASE WITH THE TOOL THAT CUTS.
(2)Remove any loose or cracked material around the damage.
(3)Lightly make rough the damaged area. Remove any layer of dirt on the surface.
WARNING : WHEN YOU USE SOLVENTS, USE COTTON GLOVES UNDER PLASTIC GLOVES THAT YOU CAN DISCARD.
(4)Clean the repair area.
(a)With a SPOP 208 solvent (Ref. 70-00-00, P. Block 201) in a soft bottle, apply solvent to the repair area.
(b)Make wet a piece of clean cheesecloth Material No.P05-038 with a SPOP 208 solvent (Ref. 70-00-00, P. Block 201).



Repair Limits for Duct Segment Surface Damage
Figure 803

(c)Wipe the repair area with the cheesecloth.
(d)Air dry the repair area for 10 minutes.
(e)Do the above steps until the surface is clean and has no oil.
(5)Apply Material No.P05-221.
(a)Mix the filler. Use equal parts by weight or volume. Mix well. The mixture is ready to use when it gels. If the temperature is between 70° and 75°F (21.1° and 23.9°C), it will gel in six minutes.
(b)Use a clean dry tool to apply the compound to the repair area.
(c)Cure the filler. Refer to the manufacturer's instructions.
(6)Make the repair area smooth.
(7)If the repair is in Area B, it is not necessary to repair the grooves.

D. Close-Up
(1)Install the stage 1 LPC (fan) blades (Ref. 72-21-02, P. Block 401).
(2)Close thrust reverser and fan cowl doors, and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

FAN EXIT CASE AND VANE ASSEMBLY - INSPECTION/CHECK

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-13-00, P. Block 301	Cowl Doors
- 72-23-02, P. Block 801	Fan Exit Case and Vane Assembly

2. Job Set-Up

A. Open, safety and tag circuit breakers for the appropriate engine and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

3. Procedure

A. The vane damage limits given in table 602 are for damage that is local and isolated. If the damage is not local and isolated, it is necessary to replace the vane immediately.

B. Inspection of Areas Other Than the Vanes (Ref. Fig. 601)

	INSPECT	DAMAGE	DISPOSITION	REPAIR
	Lockwire for : (Pre SB PW4ENG 72-262)			
	Not there, broken, loose	Not permitted	Repair immediately	(Ref. 72-23-02, P. Block 801)
	Nuts for : (Post SB PW4ENG 72-262)			
	Not there, loose	Not permitted		(Ref. 72-23-02, P. Block 801)
	Flanges B1 and B2 for :			
R	Damaged corners	Damage not permitted	Repair within 50 hours	(Ref. 72-23-02, P. Block 801)
	1	0.140 inch (3.556 mm), Reference		
	2	0.060 inch (1.524 mm), maximum, 2 places		

INSPECT	DAMAGE	DISPOSITION	REPAIR
3	0.425 inch (10.795 mm), Reference		
4	0.260 inch (6.604 mm), Reference		
5	0.150 inch (3.810 mm), Reference		
6	0.360 inch (9.144 mm), Reference		
7	0.795 inch (20.193 mm), Reference		
8	0.060 inch (1.524 mm), maximum		
9	Length : depth limit is 10 : 1		
Circumferential length of each incident	1.000 inch (25.400 mm) maximum		
Total circumferential length, all incidents, each flange	24.000 inches (609.600 mm) maximum		
Repair welds for :			
Cracks	Not permitted	If there are cracks, you must remove the case and vane assembly.	
See NOTE 1.			
Other areas for :			
Dents	0.050 in. (1.270 mm) deep maximum, with round bottoms, permitted.	Examine for cracks. If there are no cracks, the dent is serviceable. If the dent exceeds the limits, you must remove the case and vane	

INSPECT	DAMAGE	DISPOSITION	REPAIR
		assembly.	
See NOTE 2.			
Pits	0.010 in. (0.254 mm) depth maximum permitted.	You must smooth the damage. If the damage exceeds the limits, you must remove the case and vane assembly.	
Cracks in the :			
Inner case	Not permitted	If there are cracks, you must remove the case and vane assembly.	
Outer case	1.000 in. (25.40 mm) maximum circumferential length 0.500 in. (12.700 mm) maximum axial length	The engine may continue in service for 20 hours if the crack is : (a) less than the limit shown (b) is correctly stop drilled with a 0.0625 in. (0.1581 mm) drill (c) does not touch any flange or boss.	

Table 601

NOTE 1 : Use spop 70, with ultra high sensitivity penetrant, to make sure that the welds do not have cracks (Ref. 70-00-00, P. Block 201).

NOTE 2 : Use spop 70, with ultra high sensitivity penetrant, to make sure that the dents do not have cracks (Ref. 70-00-00, P. Block 201).

C. Inspection of the Vanes (Ref. Fig. 602)

INSPECT	DAMAGE	DISPOSITION	REPAIR
Leading edge for :			
Damage			
Area A			
Chord depth (axial length)	0.100 in. (2.540 mm) maximum	This damage is serviceable, but you must examine it again in less than 50 hours and at the next "A" check for deterioration. If there is deterioration, do the repair indicated in less than	(Ref. 72-23-02, P. Block 801)

INSPECT	DAMAGE	DISPOSITION	REPAIR
		50 hours.	
	more than 0.100 in. (2.540 mm)	Repair the vane in less than 50 hours.	(Ref. 72-23-02, P. Block 801)
Area B Chord depth (axial length)	0.100 in. (2.540 mm) maximum	This damage is serviceable, but you must examine it again in less than 50 hours and at the "A" check for deterioration. If there is deterioration, do the repair indicated in less than 50 hours.	(Ref. 72-23-02, P. Block 801)
	0.100 - 0.375 in. (2.5 - 9.5 mm)	Repair the vane is less than 50 hours	(Ref. 72-23-02, P. Block 801)
	More than 0.375 in. (9.525 mm)	Repair the vane immediately	(Ref. 72-23-02, P. Block 801)
Radial length	More than 1.00 in. (25.400 mm)	Remove the vane immediately	(Ref. 72-23-02, P. Block 801)
Quantity of indications	No limit if the chord depth is 0.100 in. (2.540 mm) maximum		
	4 maximum if the chord depth is 0.100 to 0.150 in. (2.54 to 3.81 mm)	Repair the vane in less than 50 hours	(Ref. 72-23-02, P. Block 801)
	1 maximum if the chord depth is more than 0.150 in. (3.81 mm). This counts against the 4 allowed above.	Repair the vane in less than 50 hours	(Ref. 72-23-02, P. Block 801)
	More than one with a chord depth that is	Remove the vane in less than 50 hours	(Ref. 72-23-02, P. Block 801)

INSPECT	DAMAGE	DISPOSITION	REPAIR
	more than 0.150 in. (3.81 mm)		
Area C for : Nicks, dents, pits, chips			
	Broken composite fibers	Repair within 50 hours	(Ref. 72-23-02, P. Block 801)
	More than 0.030 in. (0.762 mm) depth	Remove the vane within 50 hours	(Ref. 72-23-02, P. Block 801)
	More than 0.300 in. (7.620 mm) width or height	Remove the vane within 50 hours	(Ref. 72-23-02, P. Block 801)
Trailing edge for : damage			
	- Chord reduction of 0.150 in. (3.810 mm) maximum.	Repair within 50 hours	(Ref. 72-23-02, P. Block 801)
	- Chord reduction of more than 0.150 in. (3.810 mm)	Remove the vane within 50 hours	(Ref. 72-23-02, P. Block 801)
Delamination	More than 1 sq.in. (645 mm^2)	Remove the vane within 50 hours	(Ref. 72-23-02, P. Block 801)
Delamination/ Missing wire mesh	Full axial width both sides up to full span	Replace leading edge up to full span	(Ref. 72-23-02, P. Block 801)
Erosion of leading edge (wire mesh or metal shield configuration)	Any location on leading edge up to 0.150 in. (3.81 mm) in depth and 60 percent of length of FEGV maximum.	Replace wire mesh leading edge up to full span.	(Ref. 72-23-02, P. Block 801)
		Replace with metal leading edge or wire mesh up to full span.	(Ref. 72-23-02, P. Block 801)
	Any location on leading edge beyond 0.150 in. (3.81 mm) in depth and 60 percent of length of FEGV maximum.	Replace vane.	(Ref. 72-23-02, P. Block 801)
Metal leading	Dents or other	Serviceable.	

INSPECT	DAMAGE	DISPOSITION	REPAIR
edge for dents and impact only (visually inspect only)	damage up to 0.200 in. (5.080 mm) in length and 0.050 in. (1.270 mm) depth and within 3.0 in. (76.200 mm) of either base (Area A).		
	Dents beyond 0.200 in. (5.080 mm) in length and 0.050 in. (1.270 mm) depth, and located beyond 3.0 in. (76.200 mm) of either base (Area A).	Remove the vane at next shop visit.	
Metal leading edge disbonded from vane (Visually inspect only)	Visual inspection shows leading edge is separated from vane airfoil on one side only, and separation does not extend beyond 3.0 in. (76.200 mm) of either base (Area A).	Serviceable.	
	Visual inspection shows leading edge is separated from vane airfoil on one side only, and separation does extend beyond 3.0 in. (76.200 mm) of either base (Area A).	Remove the vane at next shop visit.	
	Visual inspection shows leading edge is separated from vane airfoil on both sides at the same location or is completely missing.	Remove vane immediately (See NOTE 1).	(Ref. 72-23-02, P. Block 801)

INSPECT	DAMAGE	DISPOSITION	REPAIR
Metal leading edge contains crack(s). (Visually inspect only)	Any degree of cracking whether isolated or interconnected.	Remove vane immediately (See NOTE 1).	(Ref. 72-23-02, P. Block 801)
Vane not there	Three vanes maximum, not adjacent.	Remove the vanes at first opportunity. Replace at the next visit to a shop.	(Ref. 72-23-02, P. Block 801)
	4-5 vanes not there, maximum of 3 adjacent vanes not there, each group of missing vanes must be separated from the next missing vane by 5 vanes minimum.	Remove the vanes immediately. Replace vanes or remove engine within 50 hours.	(Ref. 72-23-02, P. Block 801)

Table 602

NOTE 1 : It is acceptable to continue service with leading edge missing or removed (operator's discretion). Vane will quickly erode and may not be repairable later. The same time and spacing limits apply as if the vane was not there and any vanes missing leading edges must be included in vane not there criteria.

D. Inspection of the Bases of the Vanes (Ref. Fig. 603)

	INSPECT	DAMAGE	DISPOSITION	REPAIR
	1 reference	0.75 in. (19.050 mm)		
	2 reference	1.380 in. (35.052 mm)		
	Base, ID and OD, for :			
R	Cracks	The base platform section on one side of a crack in Area G makes a continuous surface with the section on the other side of the crack	Serviceable	
R		The base platform section on one side	Repair immediately	(Ref. 72-23-02, P. Block 801)

	INSPECT	DAMAGE	DISPOSITION	REPAIR
R		of a crack in Area G is higher than the section on the other side of the crack See NOTE 1.		
		A crack in the structural part of the base causes the vane to be loose	Remove the vane within 50 hours	(Ref. 72-23-02, P. Block 801)
		15 cracks in each mold, maximum	Serviceable	
		More than 15 cracks in a mold	Remove the vane within 50 hours	(Ref. 72-23-02, P. Block 801)
		Cracks in the mold with spaces between the mold and the base or vane	Remove the vane within 50 hours	(Ref. 72-23-02, P. Block 801)
		Cracks in the mold that cause damage to the attachment holes in the bases	Remove the vane within 50 hours	(Ref. 72-23-02, P. Block 801)
R	Piece or pieces not there	In Area G (See NOTE 2)	Engine can continue to operate until the next scheduled maintenance visit with inspection at 2A check intervals for vane security and further damage. Any amount can be missing on one single vane. A total of 5 vanes can have this condition. There cannot be two adjacent vanes with this condition.	(Ref. 72-23-02, P. Block 801)
		In the structural part of the base	Remove the vane within 50 hours	(Ref. 72-23-02, P. Block 801)

INSPECT	DAMAGE	DISPOSITION	REPAIR
	to cause a loose vane		

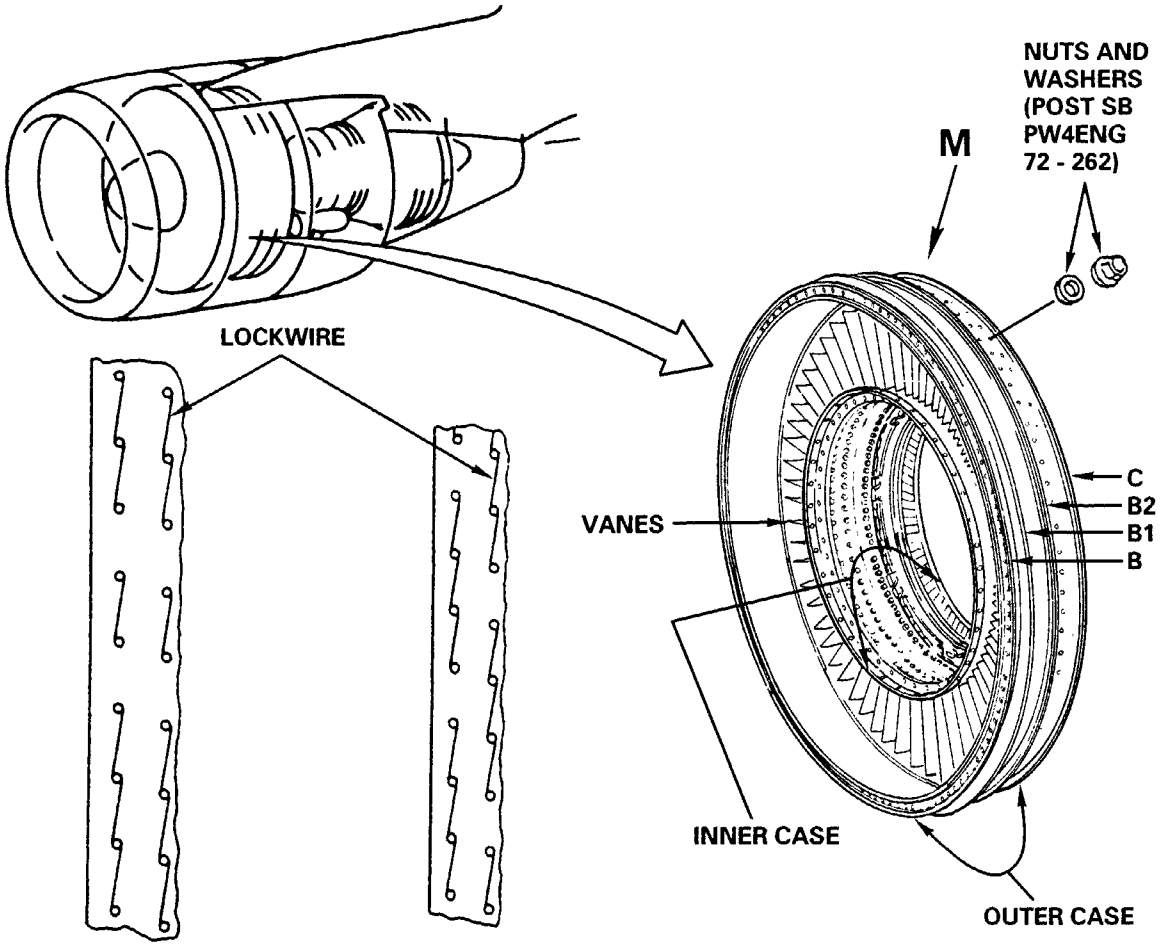
Table 603

NOTE 1 : If a crack in the base platform could lengthen to cause a piece to not be there, it is permitted to remove the piece.

NOTE 2 : Foam baffles below the base platform can be missing in any amount.

E. Close-Up

(1)Close thrust reverser and fan cowl doors. Remove safety clips and tags and close circuit breakers for the appropriate engine (Ref. 71-13-00, P. Block 301).



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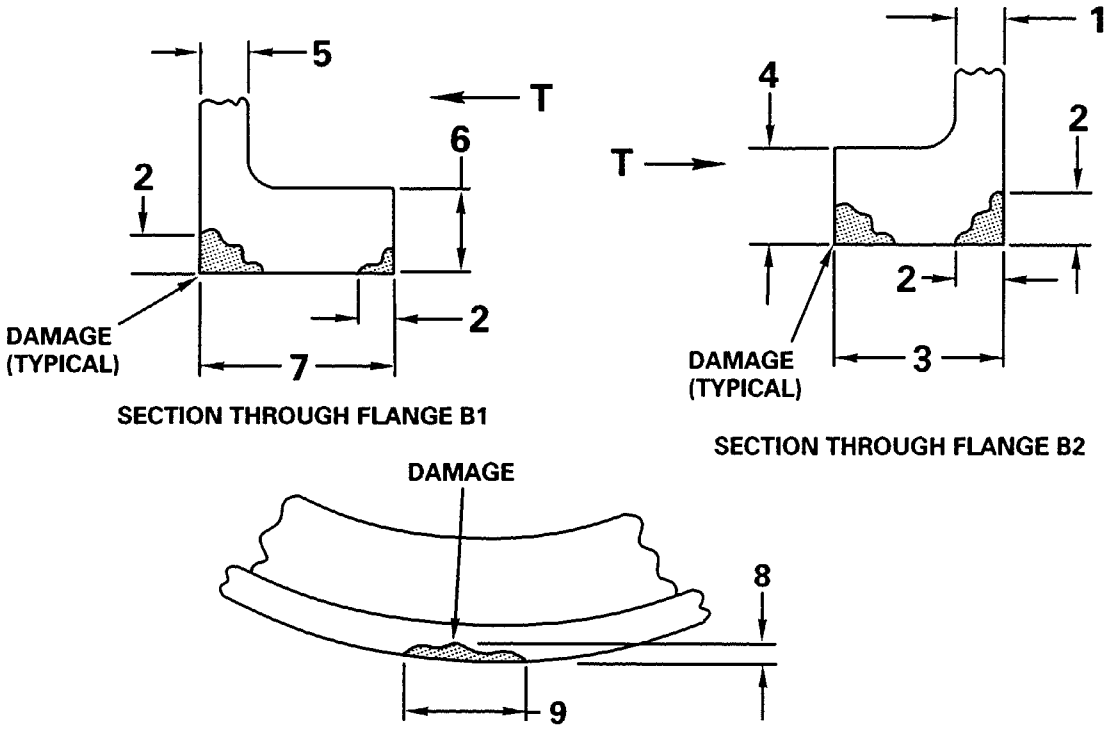
Inspection of Areas Other Than the Vanes (Sheet 1/2)
Figure 601



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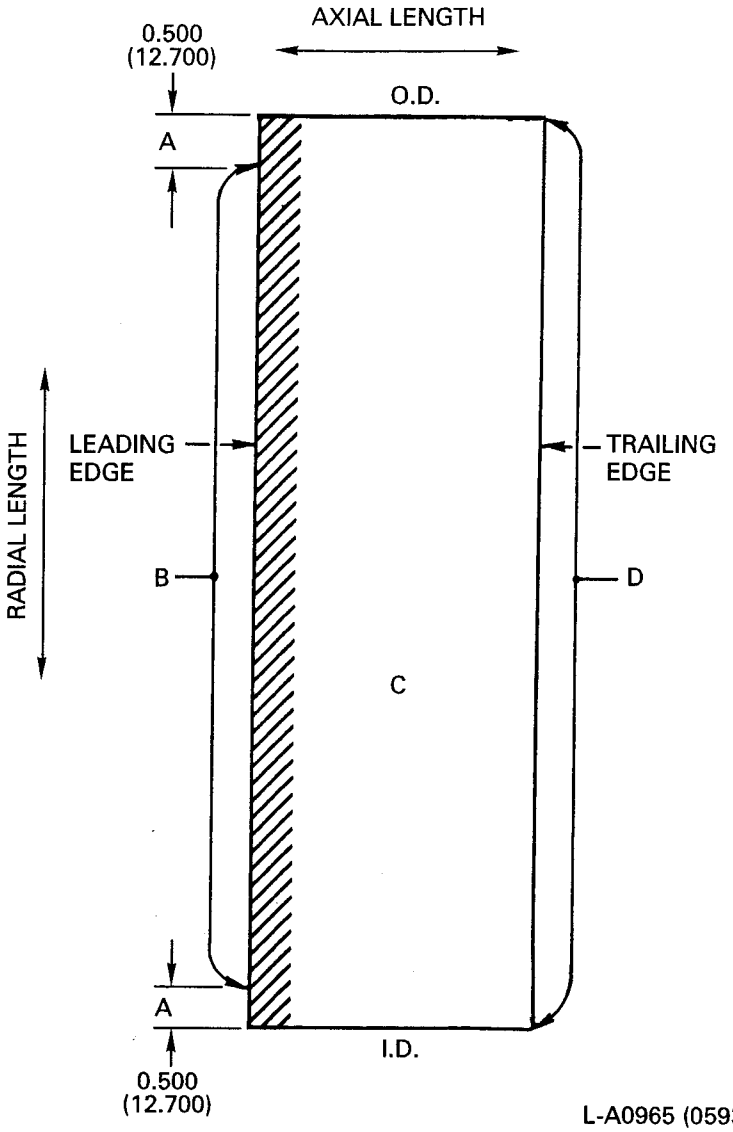
Inspection of Areas Other Than the Vanes (Sheet 2/2)
Figure 601



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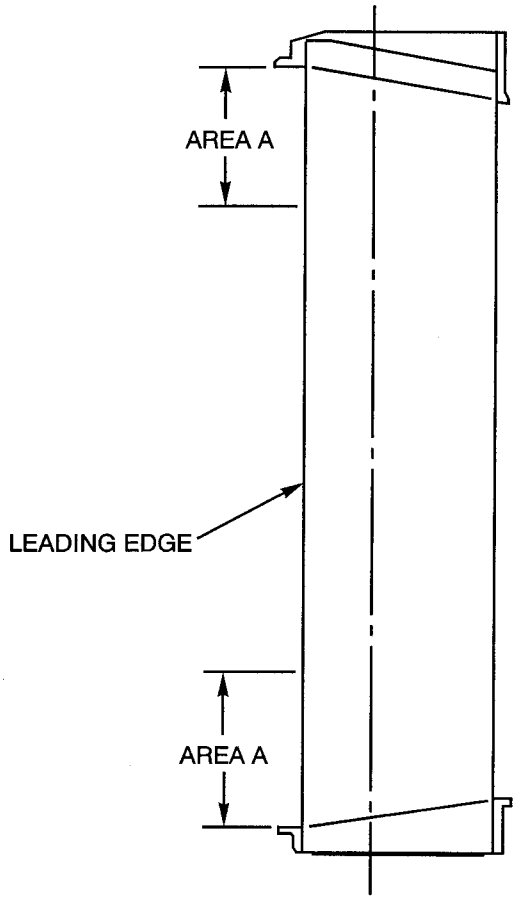
Inspection of the Vane Airfoils (Sheet 1/2)
Figure 602

R



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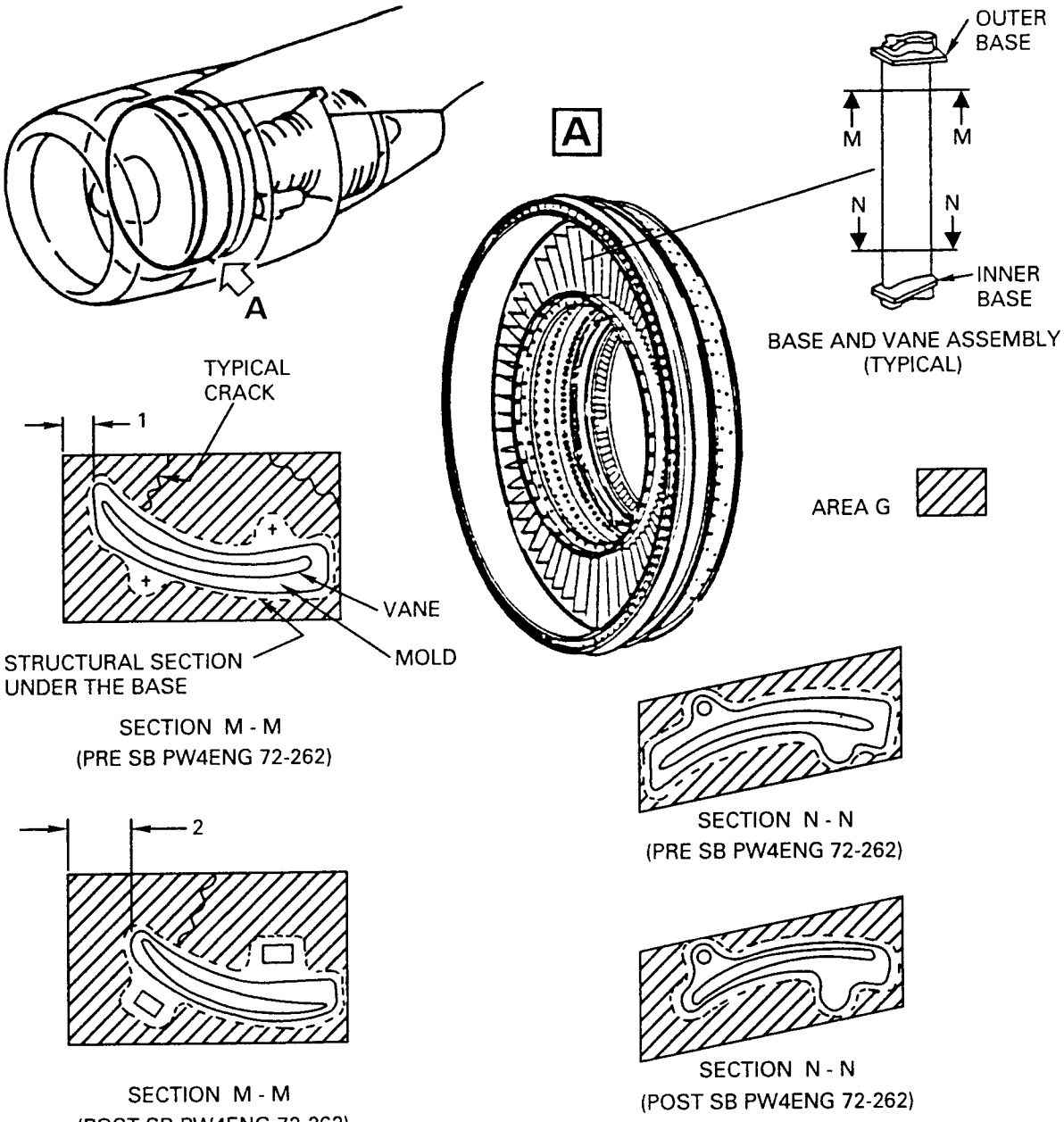
Inspection of the Vane Airfoils
(Leading Edge Damage)(Sheet 2/2)
Figure 602

R



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Inspection of the Bases of the Vanes
Figure 603

1. Repair the Airfoil of a Vane with a Patch (All Areas of the Airfoil, Smaller Damage) - Fan Exit Case and Vane

A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. Material No.P05-038	Special Materials (Ref. 70-00-00)
C. Material No.P05-152	Special Materials (Ref. 70-00-00)
D. Material No.P05-182	Special Materials (Ref. 70-00-00)
E. Material No.P08-016	Bonding and Adhesive Compounds (Ref. 70-00-00)
F. Material No.P11-014	Cleaning Agents (Ref. 70-00-00)
G.	Sandpaper
H.	Soft Brush
I.	Tongue Depressor
J.	Spatula
Referenced Procedure	
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up

(1)Open, safety and tag circuit breakers for the appropriate engine and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Repair Procedure (Ref. Fig. 801)

NOTE : In this procedure, the words "damage" and "repair area" are not the same thing. The repair area is larger than the damage itself. The repair area includes the total area that you clean, sand and patch.

WARNING : THE MATERIAL No.P08-016 IS POISONOUS. DO NOT GET INTO YOUR EYES OR MOUTH. DO NOT LET THE MATERIAL/COMPOUND TOUCH YOUR SKIN. MAKE SURE YOU USE PROTECTIVE EQUIPMENT TO PROTECT YOURSELF.

(1)If necessary, make damaged wire mesh straight with pliers.

(2)Clean repair area with a soft brush using Wetting Agent (Material No.P05-152) and water solution. Rinse with water and air dry.

(3)Sand repair area lightly with 240-400 grit sandpaper. In area B, sand lightly a 0.025 in. (0.635 mm) perimeter.

(4)If necessary, cut a patch of Wire Cloth (Material No.P05-182) to cover repair area or up to 0.125 inch (3.175 mm) inside perimeter of repair area. Fold the patch to form either the leading or trailing edge radius. Turn the patch so that it is aligned with wire cloth in leading edge.

(5)Clean the surface of the stainless steel wire cloth before you apply the adhesive.

(a)Wipe with unsized Cheesecloth (Material No.P05-038) and Isopropyl Alcohol (Material No.P11-014).

(b)Dry the wire cloth fully, at air temperature, until there is no alcohol in it.

(6)Clean the repair area.

(a)Wipe with unsized Cheesecloth (Material No.P05-038) and Isopropyl Alcohol (Material No.P11-014).
(b)Dry repair area fully, at air temperature, until there is no alcohol.
(7)Apply mylar or teflon tape around repair area.
(8)Mix Adhesive (Material No.P08-016) and apply to repair area and patch using a tongue depressor or spatula.
(9)Wet patch fully on both sides.
(10)Apply patch to repair area.
Wind a sheet of silicone rubber, teflon or FEP release film tightly over the patch.
Apply a pressure of 5-10 psi (34.5-68.9 kPa) to the repair area for 24 hours at room temperature or 90 minutes at 240°-260°F (116°-127°C).
(11)Remove the release material and tape. Blend any excess adhesive with 240-400 grit sandpaper.

D. Close-Up
(1)Close thrust reverser and fan cowl doors. Remove safety clips and tags and close circuit breakers for the appropriate engine (Ref. 71-13-00, P. Block 301).

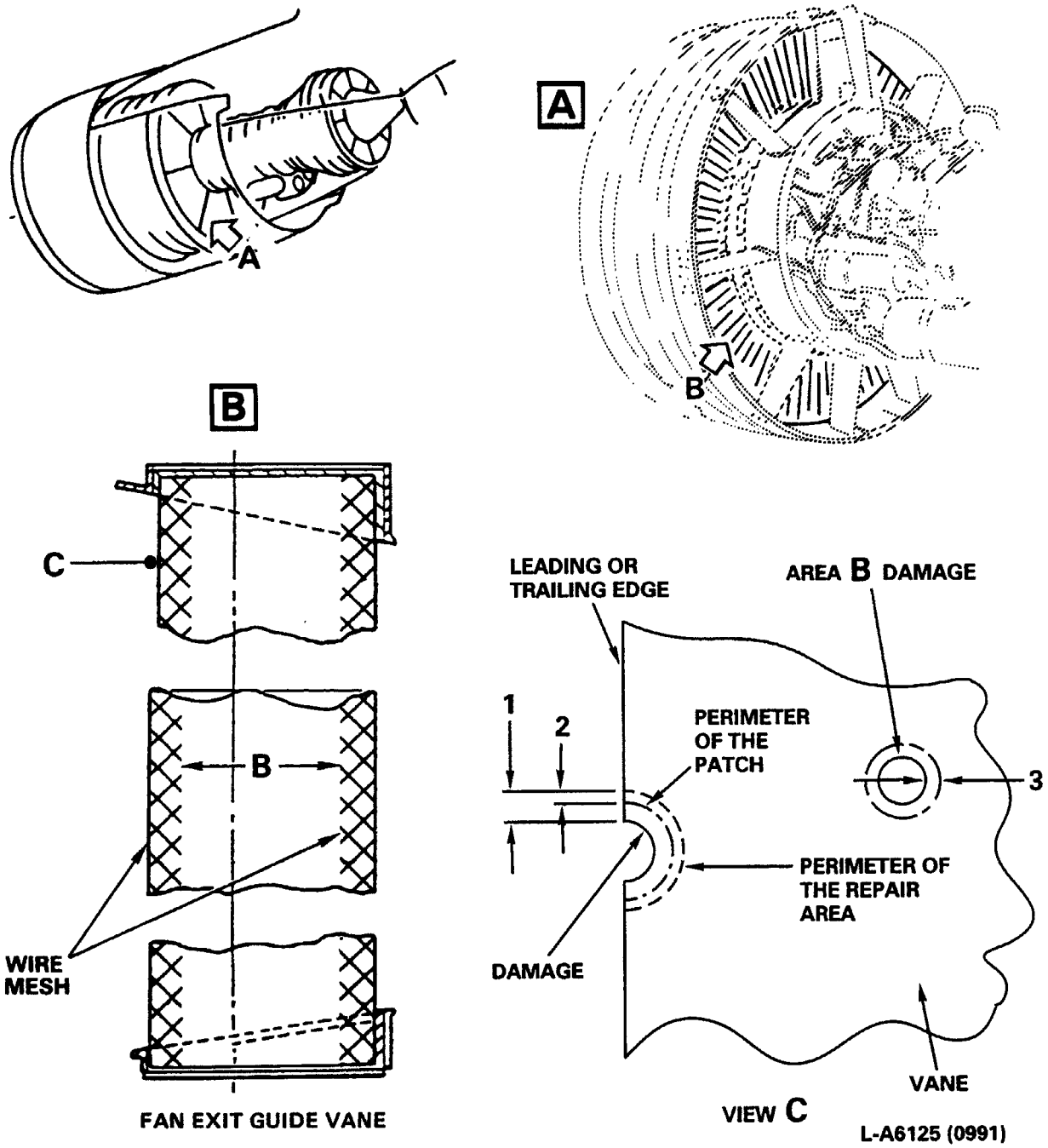

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FIGURE KEY

1. 0,5 ± 0,1 IN. (12,700 ± 2,540 MM)
2. 0,125 IN. (3,175 MM)
3. 0,025 IN. (0,635 MM)

Patch Repair Fan Exit Guide Vane
Figure 801

2. Repair the Airfoil of the Vane with a Patch (Leading Edge, Larger Damage) - Fan Exit Case and Vane

A. Equipment and Materials

R NOTE : Material No.P08-025 is an option to the mixture of Material
R No.P05-147, Material No.P08-011 or Material No.P08-020, Material
R No.P08-016 and is an option to the adhesive in the PN 814765 FEGV
R repair kit.

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	FEGV Repair kit, PN 814765
C. Material No.P05-038	Special Materials (Ref. 70-00-00)
D. Material No.P05-145	Special Materials (Ref. 70-00-00)
E. Material No.P05-147	Special Materials (Ref. 70-00-00)
F. Material No.P05-152	Special Materials (Ref. 70-00-00)
G. Material No.P05-182	Special Materials (Ref. 70-00-00)
H. Material No.P08-011	Bonding and Adhesive Compounds (Ref. 70-00-00)
I. Material No.P08-016	Bonding and Adhesive Compounds (Ref. 70-00-00)
J. Material No.P08-020	Bonding and Adhesive Compounds (Ref. 70-00-00)
K. Material No.P08-025	Bonding and Adhesive Compounds (Ref. 70-00-00)
L. Material No.P11-014	Cleaning Agents (Ref. 70-00-00)
M.	Grease Pencil
N.	Correct Marker
P.	Sandpaper
Q.	Soft Brush
R.	Tongue Depressor
S.	Spatula
Referenced Procedure	
- 71-13-00, P. Block 301	Cowl Doors

NOTE : Adhesive (Material No.P08-025) is an option to the mixture of Milled Glass (Material No.P05-147), Thickening Agent (Material No.P08-011) or Thickening Agent (Material No.P08-020), Adhesive (Material No.P08-016) is an option to the adhesive in the PN 814765 FEGV repair kit.

B. Job Set-Up

(1)Open, safety and tag circuit breakers for the appropriate engine and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Repair Procedure (Ref. Fig. 802)

NOTE : In this procedure, the words "damage" and "repair area" are not the same thing. The repair area is larger than the damage itself. The repair area includes the total area that you clean, sand and patch.

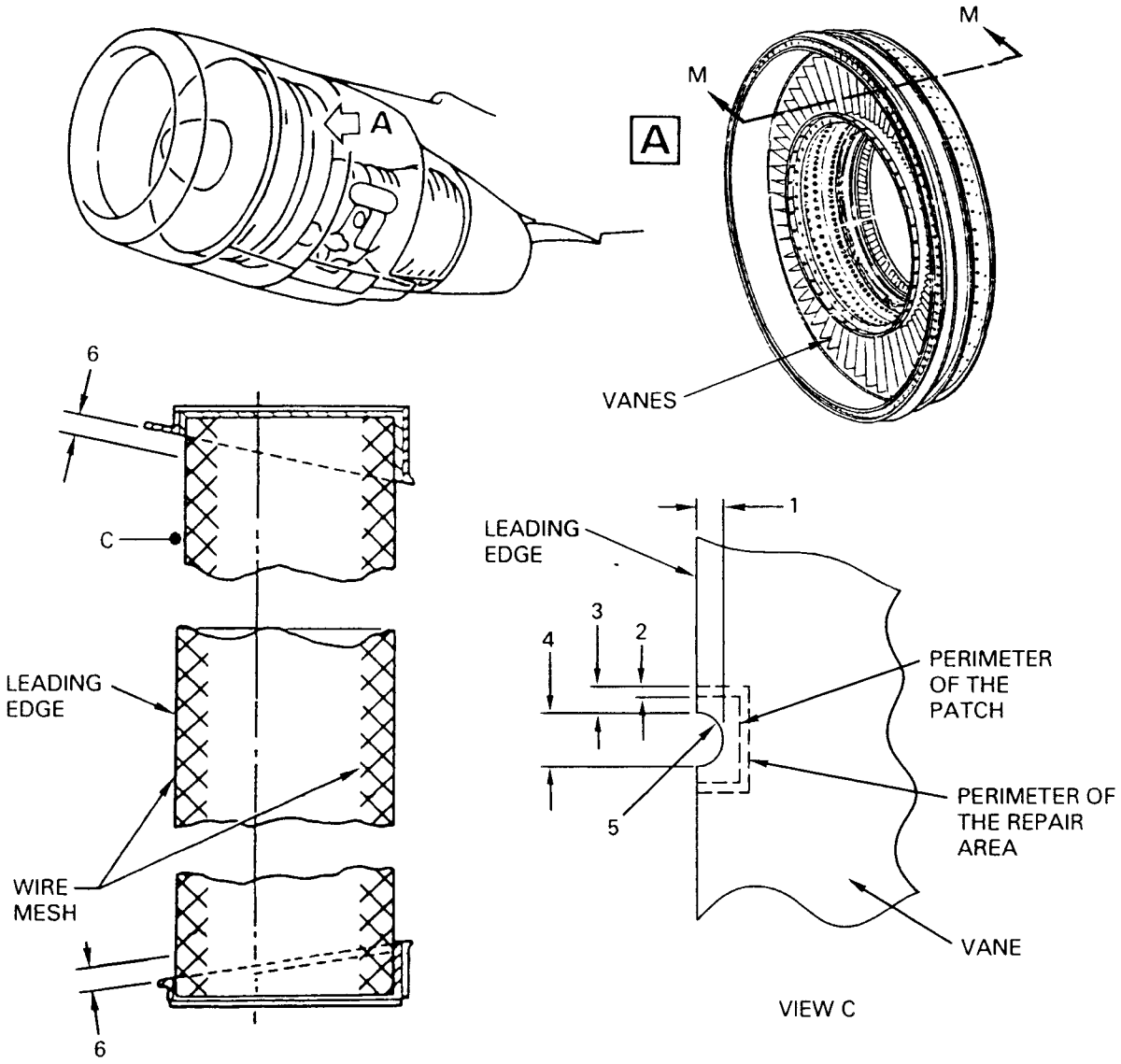
(1)Remove the damage as follows :

(a)Tap the damaged area to find out how much delamination there is. An area of delamination has a hollow sound.

(b)Make a mark around the perimeter of the damaged area. Use a grease

pencil or other correct marker.
(c)Mechanically remove damaged and loose material. File or sand the edges of the damaged area.
(2)Measure the size of the damaged area. If the area is more than the limits in the referenced figure, you must replace the vane.
(3)Clean the repair area and patch as follows :
(a)Clean the repair areas with a soft brush and a solution of Wetting Agent (Material No.P05-152) and water.
Rinse with water and air dry.
(b)Sand the repair area lightly with 240 - 400 grit sandpaper.
(c)Cut a patch of Wire Cloth (Material No.P05-182) to cover the repair area. It is permitted for the perimeter of the patch to be 0.125 in. (3.175 mm) inside the perimeter of the repair area. Fold the patch to form the leading edge radius. Turn the patch to align it with the wire cloth in the leading edge.
(d)Make a piece of Cheesecloth (Material No.P05-038) moist with Isopropyl Alcohol (Material No.P11-014). With the cheesecloth, make the patch clean.
(e)Dry the patch fully at air temperature. There must be no alcohol on the patch when you apply the adhesive.
(f)Clean the repair area. Use the same method and materials you used with the patch.
(4)Bond the patch to the vane as follows :
(a)Put mylar or teflon tape around the repair area.
(b)Use the adhesive in the FEGV Repair Kit PN 814765 or use optional Adhesive (Material No.P08-025) or as an option mix Adhesive (Material No.P08-016) with 27 - 33 percent (by weight) Milled Glass (Material No.P05-147) and 4 - 6 percent (by weight) Thickening Agent (Material No.P08-011) or (Material P08-020). Mix the mixture fully.
(c)Put the mixture on both sides of the patch. Use a lot of the mixture. Use a tongue depressor or spatula. If there is too much material, put it inside the patch to fill in the damage.
(d)Put the patch on the repair area. The epoxy mixture must not leak from the patch.
(e)Wrap a sheet of Tape (Material No.P05-145) or equivalent over the patch. Carefully attach the patch to the vane with a clamp.
NOTE : To make sure that the patch has a good fit and to minimize the mismatch of the patch-to-vane contour, use either a silicone rubber tool that is cast from the leading edge or use shims.
(f)Cure the patch for 24 hours, minimum, at 60°F (15.6°C) or for 90 minutes, minimum, at 140° - 260°F (60° - 127°C).
(g)Remove the tools (clamp, tape, etc.).
(5)Blend any unwanted adhesive with 240 - 400 grit sandpaper. A patch-to-vane mismatch of 0.030 in. (0.762 mm), maximum, is permitted.

D. Close-Up
(1)Close thrust reverser and fan cowl doors. Remove safety clips and tags and close circuit breakers for the appropriate engine (Ref. 71-13-00, P. Block 301).



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1. 0.375 INCH (9.525 MM) MAXIMUM
2. 0.0 - 0.125 INCH (0.0 - 3.2 MM)
3. 0.4 - 0.6 INCH (10.2 - 15.2 MM)
4. 0.75 INCH (19.050 MM) MAXIMUM
5. PERIMETER OF THE DAMAGE. A MAXIMUM OF ONE DAMAGED AREA PER VANE IS PERMITTED.
6. 0.5 INCH (12.700 MM) MINIMUM. NO REPAIRS PERMITTED IN THIS AREA

Repair the Leading Edge of the Vane with a Patch
Figure 802

3. Replace Fan Exit Guide Vanes

A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. Material No.P03-001	Oils (Ref. 70-00-00)
C. Material No.P05-038	Special Materials (Ref. 70-00-00)
D. Material No.P05-289	Special Materials (Ref. 70-00-00)
E. Material No.P09-029	Sealants (Ref. 70-00-00)
F. Material No.P11-014	Cleaning Agents (Ref. 70-00-00)
Referenced Procedure	
- 71-13-00, P. Block 301	Cowl Doors

B. General
(1)Fan blade removal is optional. If you remove fan blades the procedure will take two times longer to do.
(2)It will be necessary to have no less than two people do this task.
(3)Foam fairings become rigid with time. When you remove a group of fan exit guide vanes (FEGV), it will help if you use new foam fairings for the installation of FEGV.

C. Job Set-Up
(1)Open, safety and tag circuit breakers for the appropriate engine and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

D. Procedure (Ref. Fig. 803)
NOTE : This procedure gives the instructions to replace one or a group of FEGV that are damaged or not there. At least one vane must be completely removed to do this task.
(1)Remove the ID and OD platforms and fairings of the vane that is damaged or not there.

(a)If the vane to be replaced is damaged more than the maintenance manual allowance, saw out the airfoil.
(b)(Pre SB PW4 ENG 72-262). Cut the wire that locks the bolts on the OD of the fan case. Remove the bolts or nuts and washers that hold the vane OD platform.
(c)(Post SB PW4ENG 72-262). Remove slab bolts from the vane OD platform.
(d)Remove the ID and OD platforms and fairings.
(2)Remove the bolts or washers and nuts from adjacent FEGV's.
(a)(Pre SB PW4ENG 72-262). Cut the wire that locks the OD bolts to the 15 to 20 FEGV's counterclockwise direction (seen from the rear) adjacent to the vane not there. Remove the bolts or washers and nuts that hold the FEGV OD platforms.
(b)(Post SB PW4ENG 72-262). Remove slab bolts from the vane OD platforms.
(c)Use the space of the removed vane to move the OD of the adjacent FEGV clockwise (seen from the rear) to loosen the OD foam fairings.

Loosened OD fairings will permit easier removal.

(3)Collect space to remove the vane.

(a)Move the 15 to 20 FEGV at an angle counterclockwise (seen from the rear) to collect space. Make an overlap of FEGV OD platforms to collect space.

(b)Hold vane and push vane to the ID. Move vane OD base to put on to the adjacent vane base. Make an overlap of the remaining FEGV to collect space.

(c)The last 2 or 3 FEGV (adjacent to the vane not there) will be almost off their pins to collect space to replace a vane not there.

NOTE : The best procedure, to move a vane off of its pins, is to move the vane axially forward and aft slowly.

(4)Install vane and put remaining FEGVs back in position.

(a)If necessary, put a new foam fairing on the inner case ID.

(b)If necessary, put a new foam fairing on the new vane.

(c)Put the new vane on the pins of the inner case. Engage the forward pin first. When the pins and the holes are aligned, move the vane at an angle clockwise (seen from the rear) so that it will be against its ID pins.

NOTE : Prevent vane platform from catches on fan exit case edges.

(d)Put the remaining FEGV back in position.

(5)Connect the FEGV to the outer case.

WARNING : MATERIAL No.P09-029 IS POISONOUS. DO NOT GET INTO YOUR EYES OR MOUTH. DO NOT LET THIS MATERIAL TOUCH YOUR SKIN. MAKE SURE YOU USE PROTECTIVE EQUIPMENT TO PROTECT YOURSELF.

CAUTION : DO NOT USE WASHERS AT THE BOLT HOLES IN THE FAN EXIT (OUTER) CASE WITH BUSHINGS IN THEM. YOU WILL DAMAGE THE CASE AND VANE ASSEMBLY IF YOU USE THE WASHERS.

(a)(Pre SB PW4ENG 72-262) Apply Engine Oil (Material No.P03-001) to the threads of the bolts. Attach the FEGV to the outer case with washers and bolts. TORQUE the bolts to between 74 and 82 lbf.in. (0.84 and 0.92 m.daN).

Install Lockwire (Material No.P05-289).

CAUTION : DO NOT USE WASHERS AT THE BOLT HOLES IN THE FAN EXIT (OUTER) CASE WITH BUSHINGS IN THEM. YOU WILL DAMAGE THE CASE AND VANE ASSEMBLY IF YOU USE THE WASHERS.

(b)(Post SB PW4ENG 72-262) Apply Engine Oil (Material No.P03-001) to the threads of the slab bolts. Install the slab bolts through the vane, outer fairing, and outer case. Install washers and nuts on the bolts. TORQUE the nuts to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).

(c)(Post SB PW4ENG 72-262) Clean the holes where the heads of the slab bolts are, and apply Sealant (Material No.P09-029) as follows.

1 Clean the surfaces the sealant will touch with clean Cloth (Material No.P05-038) dampened with Alcohol (Material No.P11-014). Allow time to remove traces of alcohol before sealing.

2 Fill the hole with Sealant (Material No.P09-029). The sealant must be flush to plus or minus 0.040 in. (1.016 mm) maximum above or below the adjacent surfaces.

3 It is permitted to have 0.060 in. (1.524 mm) surface voids in the rubber sealant.

4 Do it at room temperature and at 25 percent minimum relative

humidity.

(d)Apply Sealant (Material No.P09-029) around the ID bases of the FEGV. The sealant must be flush to plus or minus 0.040 in. (1.016 mm) maximum above or below the adjacent surfaces.

1 Clean the surfaces the sealant will touch with clean Cloth (Material No.P05-038) dampened with Alcohol (Material No.P11-014). Allow time to remove traces of alcohol before sealing.

2 Fill the spaces with Sealant (Material No.P09-029) at room temperature and at 25 percent minimum relative humidity.

3 It is permitted to have 0.060 in. (1.524 mm) surface voids in the rubber sealant.

(e)(Post SB PW4ENG 72-262) Apply Sealant (Material No.P09-029) to the holes where the heads of the slab bolts are, as follows.

1 Clean the surfaces the sealant will touch with clean Cloth (Material No.P05-038) dampened with Alcohol (Material No.P11-014). Allow time to remove traces of alcohol before sealing.

2 Fill the hole with Sealant (Material No.P09-029). Do it at room temperature and at 25 percent minimum relative humidity.

(f)Apply Sealant (Material No.P09-029) around the ID bases of the FEGV.

1 Clean the surfaces the sealant will touch with clean Cloth (Material No.P05-038) dampened with Alcohol (Material No.P11-014). Allow time to remove traces of alcohol before sealing.

2 Fill the spaces with Sealant (Material No.P09-029) at room temperature and at 25 percent minimum relative humidity.

E. Close-Up

(1)Close thrust reverser and fan cowl doors. Remove safety clips and tags and close circuit breakers for the appropriate engine (Ref. 71-13-00, P. Block 301).

R **ON A/C 101-105,

R Post SB 71-2024 For A/C 101-105,

(5)Connect the FEGV to the outer case.

WARNING : MATERIAL No.P09-029 IS POISONOUS. DO NOT GET INTO YOUR EYES OR MOUTH. DO NOT LET THIS MATERIAL TOUCH YOUR SKIN. MAKE SURE YOU USE PROTECTIVE EQUIPMENT TO PROTECT YOURSELF.

CAUTION : DO NOT USE WASHERS AT THE BOLT HOLES IN THE FAN EXIT (OUTER) CASE WITH BUSHINGS IN THEM. YOU WILL DAMAGE THE CASE AND VANE ASSEMBLY IF YOU USE THE WASHERS.

(a)Apply Engine Oil (Material No.P03-001) to the threads of the slab bolts. Install the slab bolts through the vane, outer fairing, and outer case. Install washers and nuts on the bolts. TORQUE the nuts to between 85 and 95 lbf.in. (0.97 and 1.07 m.daN).

(b)Clean the holes where the heads of the slab bolts are, and apply Sealant (Material No.P09-029) as follows.

1 Clean the surfaces the sealant will touch with clean Cloth (Material No.P05-038) dampened with Alcohol (Material No.P11-014). Allow time to remove traces of alcohol before sealing.

2 Fill the hole with Sealant (Material No.P09-029). The sealant must be flush to plus or minus 0.040 in. (1.016 mm) maximum above or below the adjacent surfaces.

3 It is permitted to have 0.060 in. (1.524 mm) surface voids in the rubber sealant.

4 Do it at room temperature and at 25 percent minimum relative humidity.

(c)Apply Sealant (Material No.P09-029) around the ID bases of the FEGV. The sealant must be flush to plus or minus 0.040 in. (1.016 mm) maximum above or below the adjacent surfaces.

1 Clean the surfaces the sealant will touch with clean Cloth (Material No.P05-038) dampened with Alcohol (Material No.P11-014). Allow time to remove traces of alcohol before sealing.

2 Fill the spaces with Sealant (Material No.P09-029) at room temperature and at 25 percent minimum relative humidity.

3 It is permitted to have 0.060 in. (1.524 mm) surface voids in the rubber sealant.

(d)Apply Sealant (Material No.P09-029) to the holes where the heads of the slab bolts are, as follows.

1 Clean the surfaces the sealant will touch with clean Cloth (Material No.P05-038) dampened with Alcohol (Material No.P11-014). Allow time to remove traces of alcohol before sealing.

2 Fill the hole with Sealant (Material No.P09-029). Do it at room temperature and at 25 percent minimum relative humidity.

(e)Apply Sealant (Material No.P09-029) around the ID bases of the FEGV.

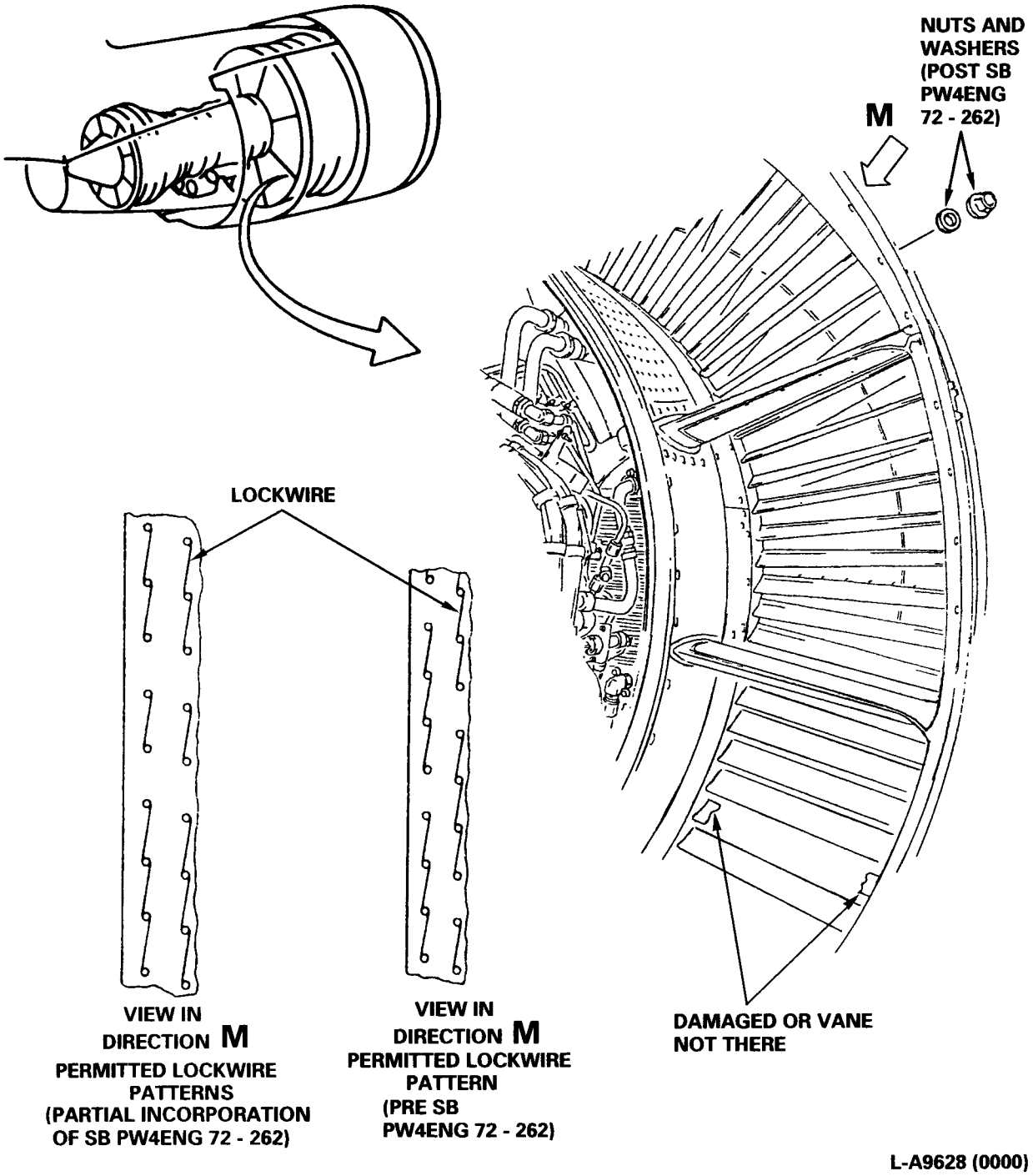
1 Clean the surfaces the sealant will touch with clean Cloth (Material No.P05-038) dampened with Alcohol (Material No.P11-014). Allow time to remove traces of alcohol before sealing.

2 Fill the spaces with Sealant (Material No.P09-029) at room

temperature and at 25 percent minimum relative humidity.

E. Close-Up

(1)Close thrust reverser and fan cowl doors. Remove safety clips and tags and close circuit breakers for the appropriate engine (Ref. 71-13-00, P. Block 301).


NUTS AND WASHERS (POST SB PW4ENG 72 - 262)
M
LOCKWIRE
VIEW IN DIRECTION M
PERMITTED LOCKWIRE PATTERNS (PARTIAL INCORPORATION OF SB PW4ENG 72 - 262)
VIEW IN DIRECTION M
PERMITTED LOCKWIRE PATTERN (PRE SB PW4ENG 72 - 262)
DAMAGED OR VANE NOT THERE
L-A9628 (0000)

BM5 72 23 02 8 KNM0 00

Damaged or Vane Not There
Figure 803

**ON A/C 101-200,

(Ref. Fig. 804)
(Ref. Fig. 805)

4. Vane Removal/Repair

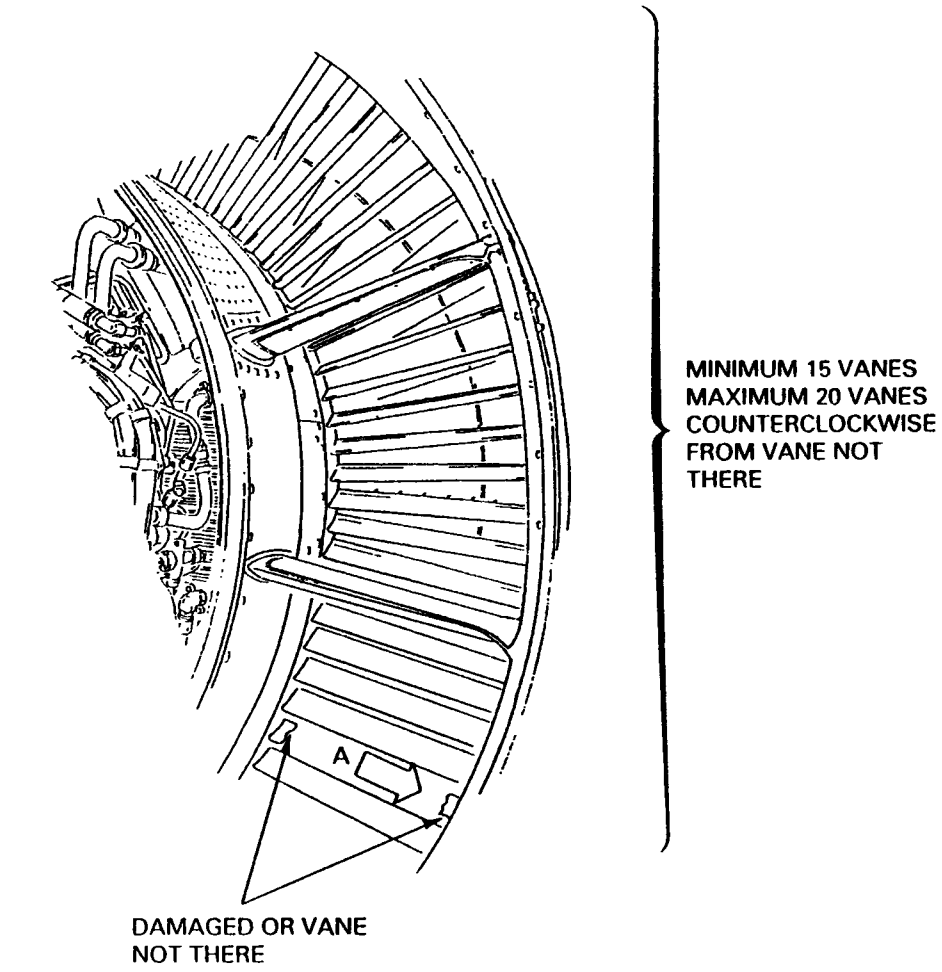
A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. Material No.P05-135	Special Materials (Ref. 70-00-00)
C. Material No.P09-014	Sealants (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag circuit breakers for the appropriate engine and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure (Ref. Fig. 806)
(1)Cut damaged vane at the edge of the flowpath surface ID and OD bases, and do not damage adjacent vanes.
(2)Let the OD base stay attached to the outer case.
(3)Carefully lift the leading and trailing edge of the base and remove the base from the pins.
(4)Drill a 0.125 in. (3.175 mm) diameter hole through the center of the trailing edge hole to the flowpath surface of the ID vane base.
(5)Clean the base, base plate, inner case, and pins with a SPOP 208 solvent (Ref. 70-00-00, P. Block 201) and allow to dry for fifteen minutes.
(6)Apply Sealant (Material No.P09-014) heavily to the ID surface of the base, the case cavity, and the pins.
(7)Install the ID base on the pins and push the base against the case to push out all unwanted sealant.
(8)Rub and remove unwanted sealant from the flowpath surface.
(9)Apply Tape (Material No.P05-135) over the base, the adjacent bases, the fan exit fairing, and the fan exit liner segment.

D. Close-Up
(1)Close thrust reverser and fan cowl doors. Remove safety clips and tags and close circuit breakers for the appropriate engine (Ref. 71-13-00, P. Block 301).



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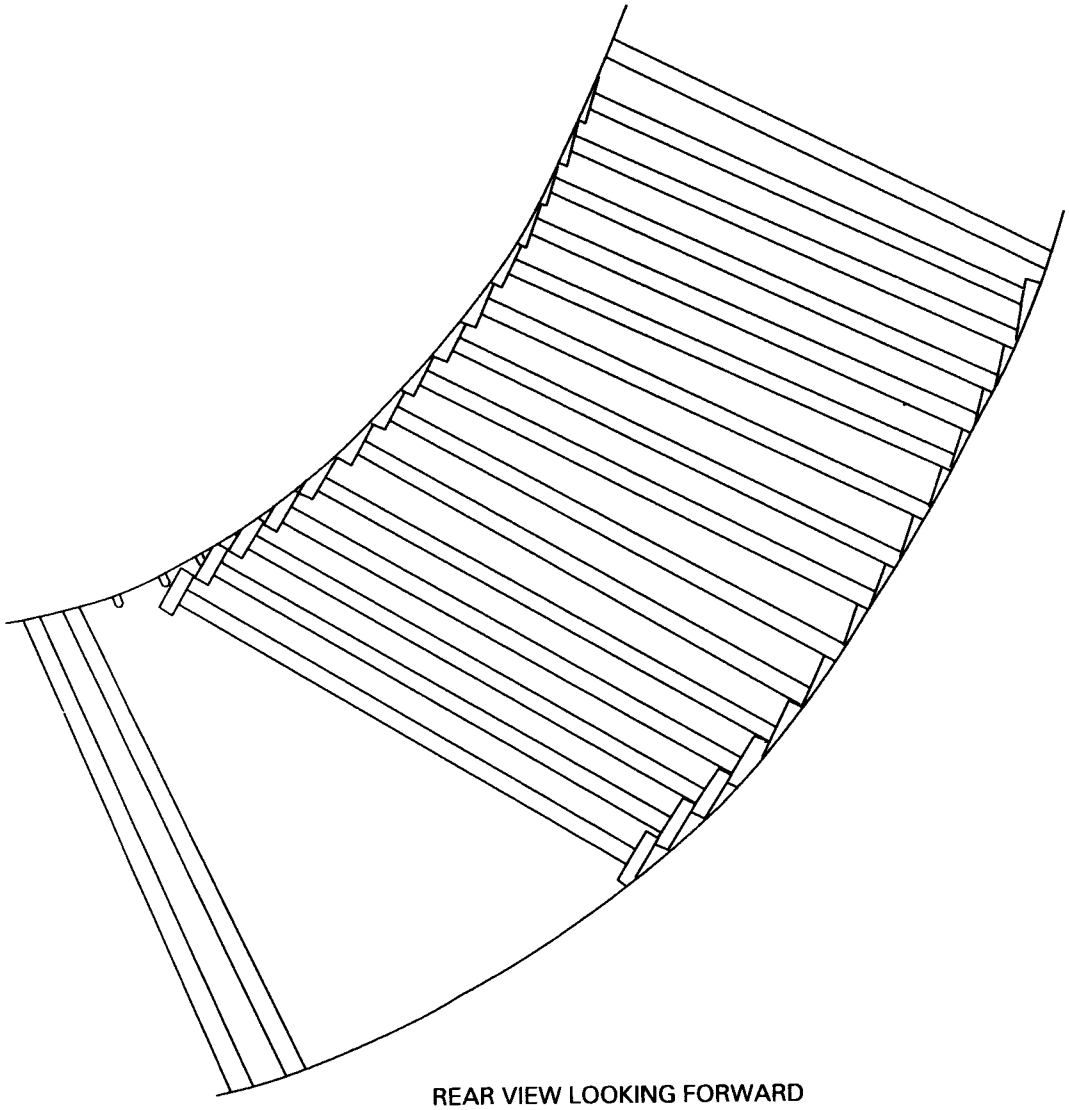
Count, Remove and Move Vanes Clockwise
Figure 804

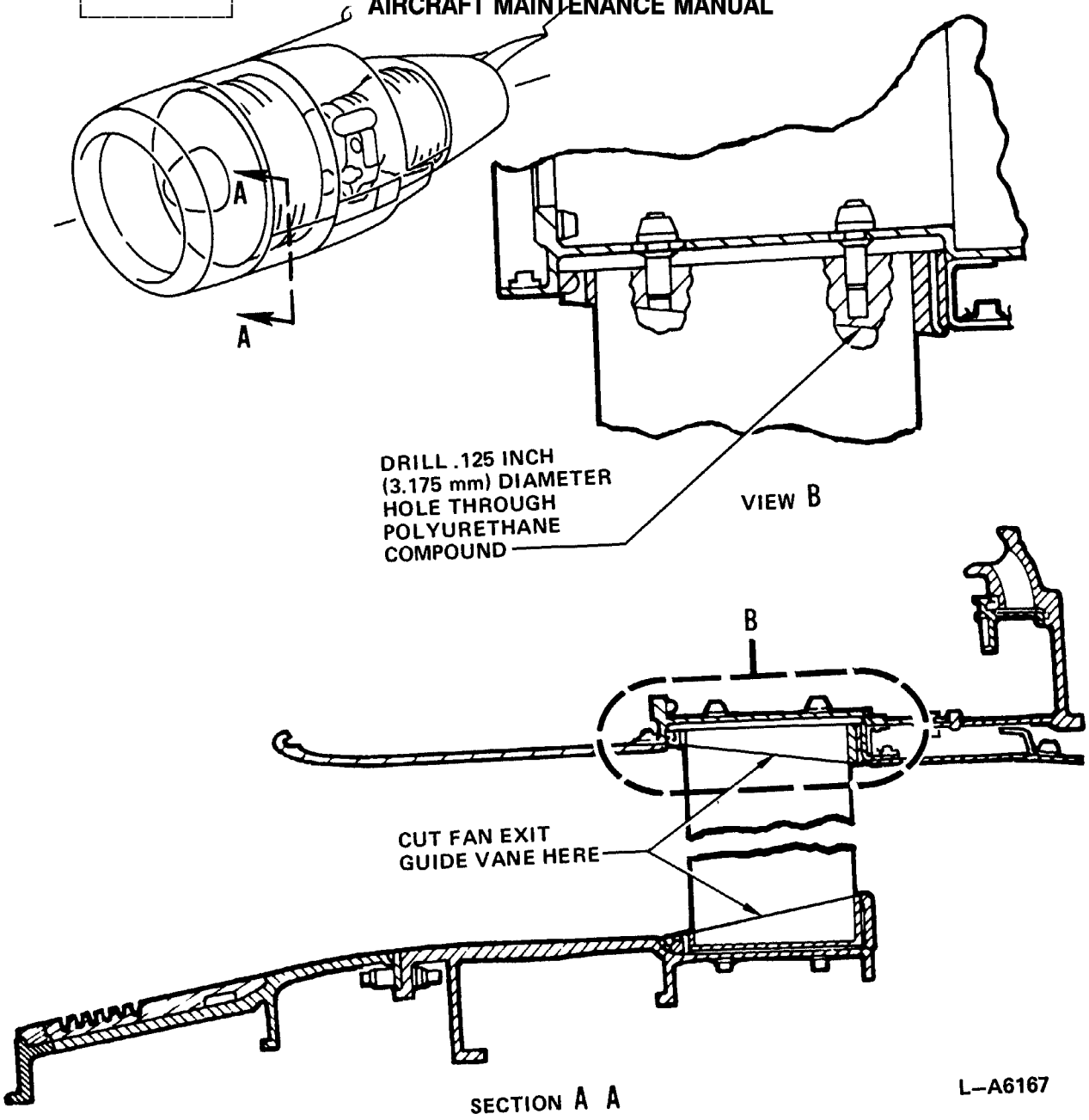


REAR VIEW LOOKING FORWARD

BM5 72 23 02 8 KRM0 00

L-A9631 (0000)

Overlap the Vanes
Figure 805



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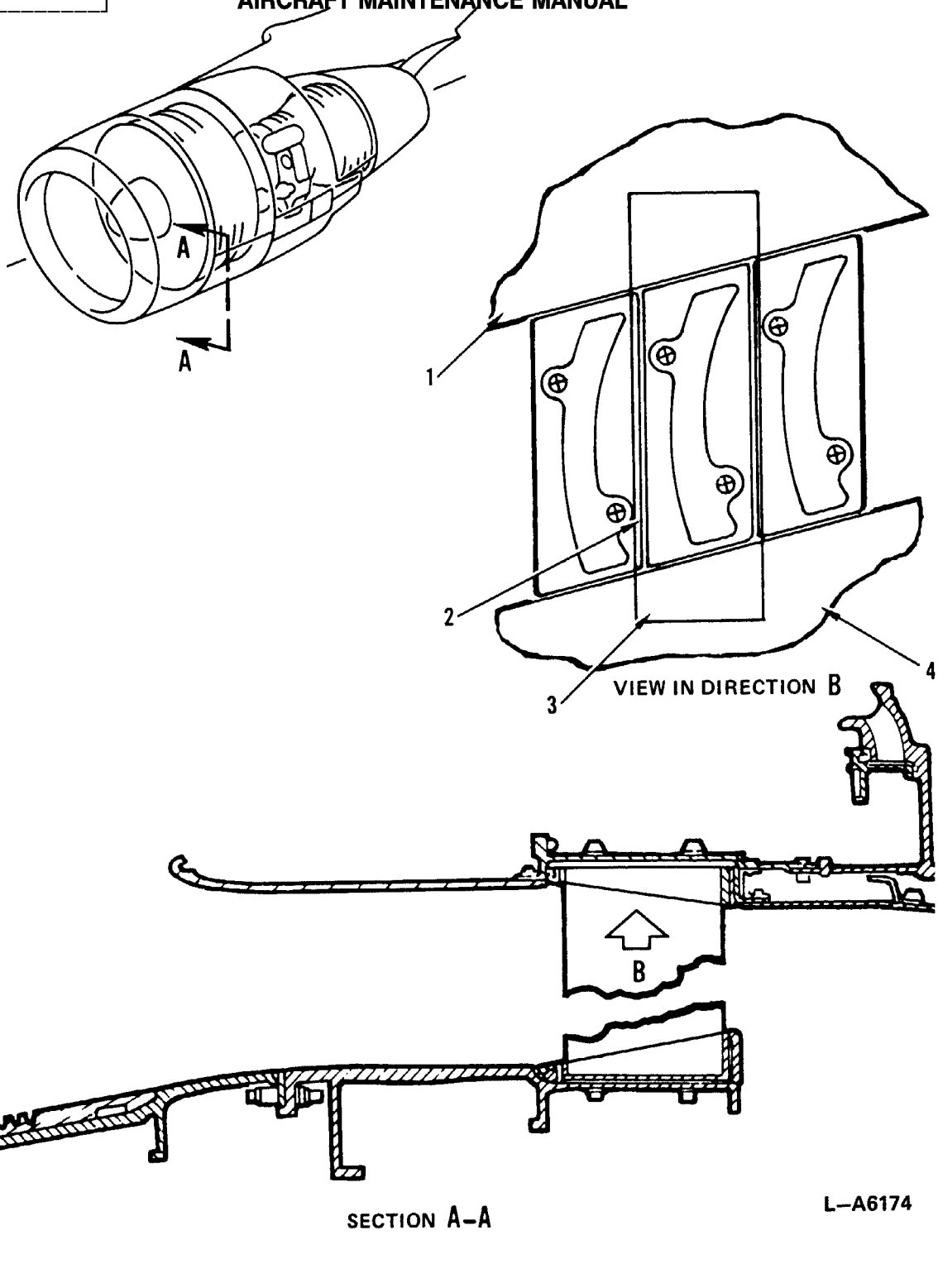
Vane Removal/Repair (Sheet 1/2)
Figure 806



Vane Removal/Repair (Sheet 2/2)
Figure 806

5. Replace the Lockwire and Nuts for the Vanes

A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. Material No.P03-001	Oils (Ref. 70-00-00)
C. Material No.P05-289	Special Materials (Ref. 70-00-00)
Referenced Procedure	
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag the circuit breakers for the appropriate engine and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure (Ref. Fig. 807)
(1)(PRE SB PW4ENG 72-262). Replace any damaged, loose, or broken lockwire.
(a)Remove the lockwire.
(b)Install new Lockwire (Material No.P05-289) for the correct pattern(s) (Ref. Fig. 807).
(2)(POST SB PW4ENG 72-262). Replace any washers or nuts that keep the vanes in position and that are not there.
NOTE : The nuts are installed on the shanks of slab-bolts that come through the case.
(a)Apply Engine Oil (Material No.P03-001) to the threads of the nut.
(b)Install the washer on the slab-bolt. Install the nut on the slab-bolt. TORQUE the nut to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

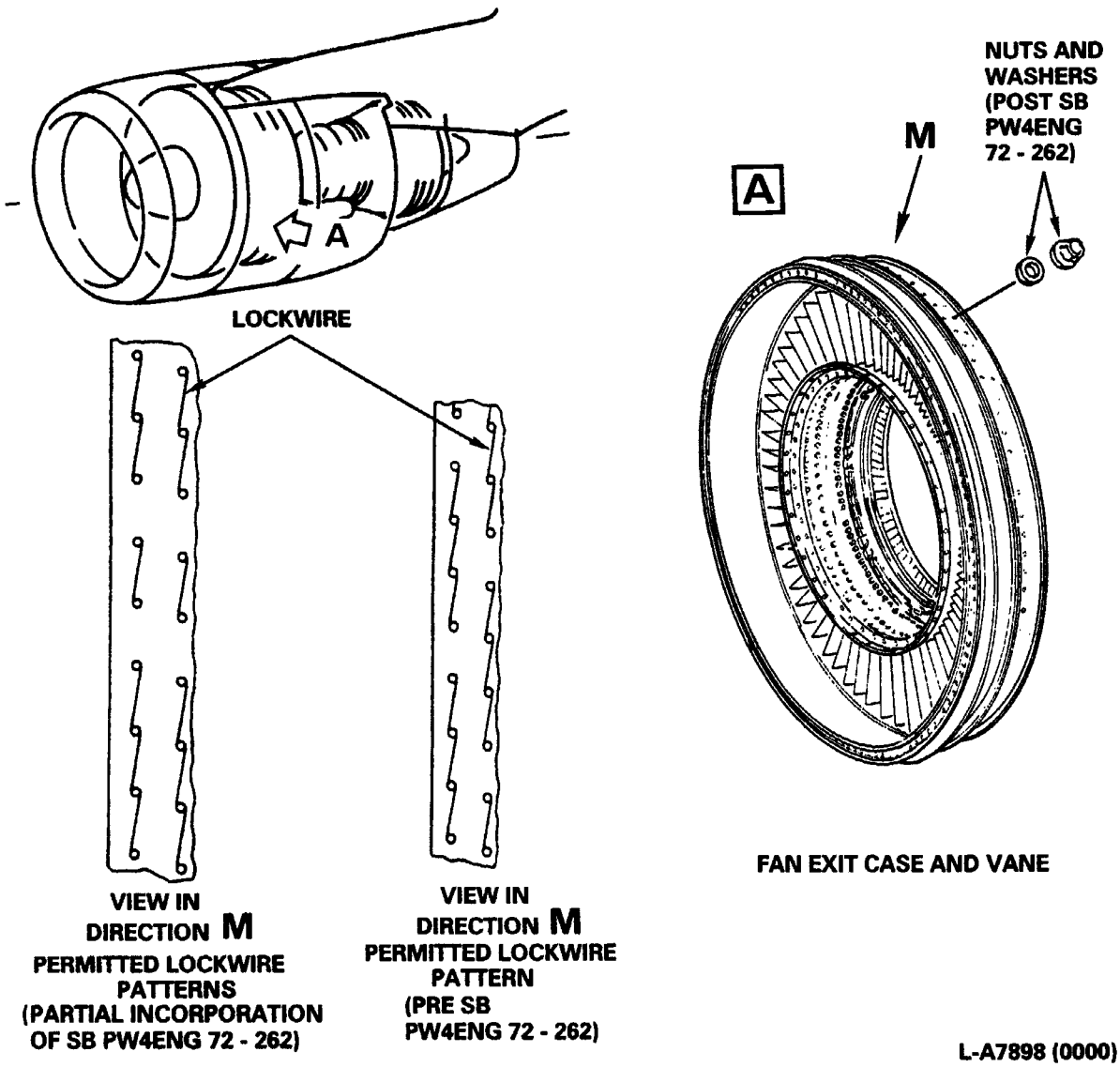
D. Close-Up
(1)Close thrust reverser and fan cowl doors. Remove safety clips and tags and close circuit breakers for the appropriate engine (Ref. 71-13-00, P. Block 301).

6. Repair Base and Vane Assembly Cracked or Broken Bases

A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. Material No.P09-014	Sealants (Ref. 70-00-00)
C. Material No.P09-029	Sealants (Ref. 70-00-00)
D. Material No.P11-014	Cleaning Agents (Ref. 70-00-00)
E.	Sandpaper
Referenced Procedure	
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-up
(1)Open, safety and tag the circuit breakers for the appropriate engine


A
LOCKWIRE
NUTS AND WASHERS (POST SB PW4ENG 72 - 262)
M
A
VIEW IN DIRECTION M
PERMITTED LOCKWIRE PATTERNS (PARTIAL INCORPORATION OF SB PW4ENG 72 - 262)
VIEW IN DIRECTION M
PERMITTED LOCKWIRE PATTERN (PRE SB PW4ENG 72 - 262)
FAN EXIT CASE AND VANE
L-A7898 (0000)

BM5 72 23 02 8 KEMO - 01

Permitted Lockwire Patterns and Nut Replacement
Figure 807

and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure To Repair a Base that has a Piece that is not there (Ref. Fig. 808)
(1)If there are loose pieces on a base, remove them.
(2)Clean the repair area with Isopropyl Alcohol (Material No.P11-014).
Fully dry the repair area in air that is at room temperature.
It is necessary to dry the repair area until there is no alcohol on the part.
(3)Apply Sealant (Material No.P09-014) or (Material No.P09-029) to the repair area. Make the contour of the repair area agree with the contour of the un-repaired area.
(4)Cure the sealant in air that is :
(a)At room temperature
(b)Has a relative humidity of 20 percent, minimum.
(c)For two hours, minimum
(d)Until no longer tacky.

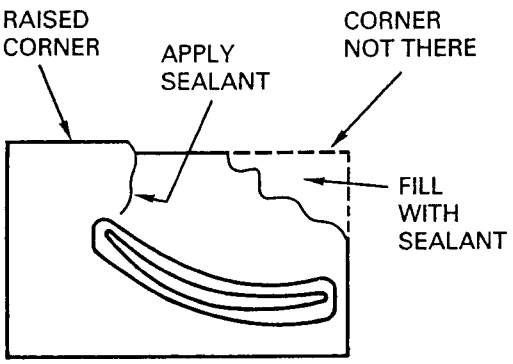
D. Procedure to Repair a Cracked Base (Ref. Fig. 808)
(1)Clean the repair area with Isopropyl Alcohol (Material No.P11-014).
Fully dry the repair area in air that is at room temperature.
It is necessary to dry the repair area until there is no alcohol on the part.
(2)Make the surface of the crack rough with 240-400 grit sandpaper.
(3)Clean the repair area with Isopropyl Alcohol (Material No.P11-014).
Fully dry the repair area in air that is at room temperature.
It is necessary to dry the repair area until there is no alcohol on the part.
(4)Apply Sealant (Material No.P09-014) or (Material P09-029) to the repair area.
Make the contour of the repair area agree with the contour of the un-repaired area.
(5)Cure the sealant in air that is :
(a)At room temperature.
(b)Has a relative humidity of 20 percent, minimum.
(c)For two hours, minimum, and
(d)Until no longer tacky.

E. Close-Up
(1)Close thrust reverser and fan cowl doors. Remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

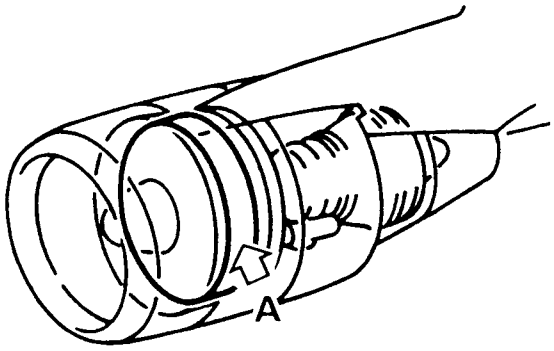
7. Smooth Damage - Fan Exit Case and Vane

A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors



SECTION M - M



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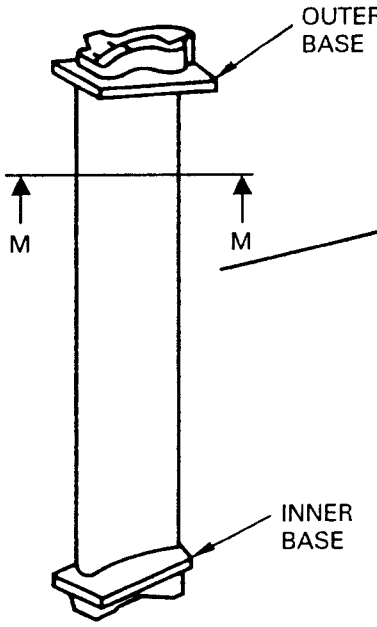
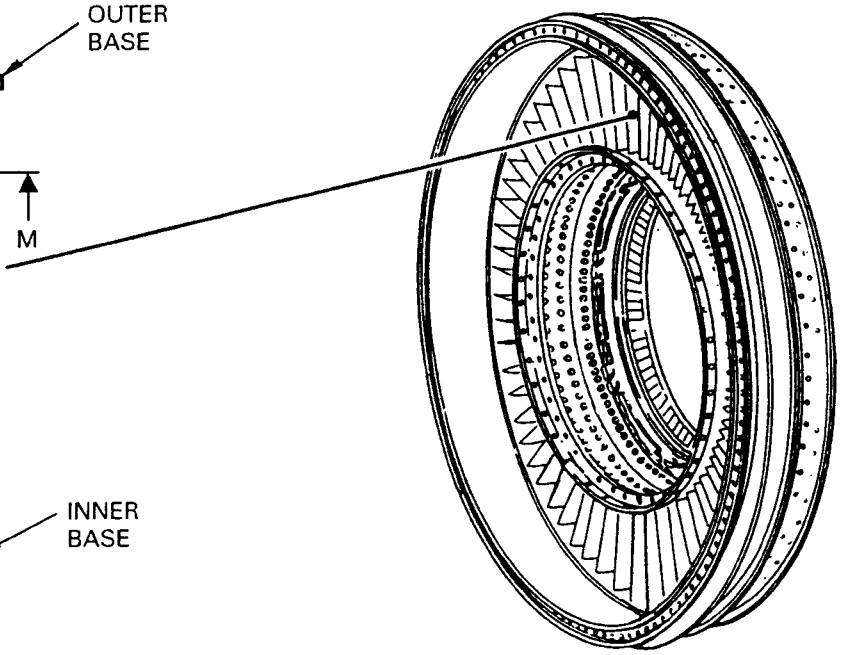


BASE AND VANE ASSEMBLY
(TYPICAL)



FAN EXIT CASE AND VANE ASSEMBLY

L-A7738 (0992)

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Repair of the Bases of the Fan Exit Base and Vane Assembly Broken Corners
Figure 808

B. Job Set-Up
(1)Open, safety and tag the circuit breakers for the appropriate engine and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure (Ref. Fig. 809)
(1)Examine the damaged corners of flanges B1 and B2 for cracks. Use SPOP 70. Use high sensitivity penetrant. If there is a crack in the damaged area, do not do the repair.
(2)Smooth the damage on the corners of the B1 and B2 flanges. (Ref. Fig. 809) and table 801 for limits.

INSPECT	SERVICEABLE LIMITS	REPAIRABLE LIMITS
Flanges B1 and B2 for damaged corners	Not Permitted	
1		0.140 in. (3.556 mm), Reference
2		0.060 in. (1.524 mm), Maximum, 2 Places
3		0.425 in. (10.795 mm), Reference
4		0.260 in. (6.604 mm), Reference
5		0.150 in. (3.810 mm), Reference
6		0.360 in. (9.144 mm), Reference
7		0.795 in. (20.193 mm), Reference
8		0.060 in. (1.524 mm), maximum
9		Length : depth limit is 10 : 1
Circumferential length of each incident		1.000 in. (25.400 mm) maximum
Total circumferential length, all incidents, each flange.		24.000 in. (609.600 mm) maximum

Smooth Damaged Corners on the B1 and B2 Flanges
Table 801

(3)Examine the smoothed areas. Use SPOP 70. Use high sensitivity penetrant. There must be no cracks.
(4)Apply anodize touch-up solution to smoothed areas. Use SPOP 42.

D. Close-Up
(1)Close thrust reverser and fan cowl doors. Remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

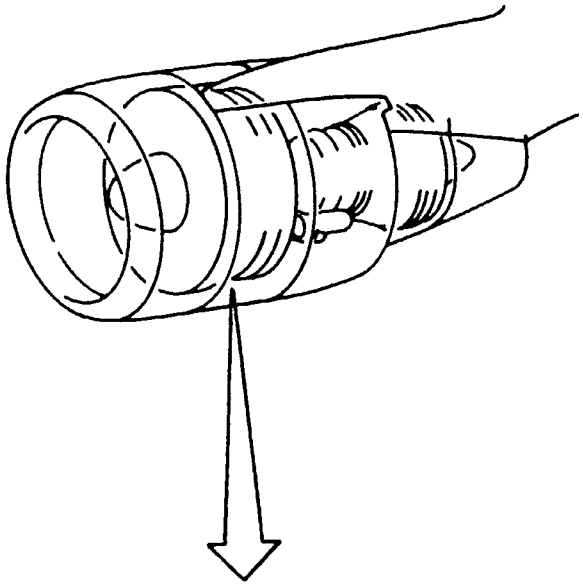
8.Repair the Airfoil of the Vane with a Partial or Full Span Replacement of the Wire Mesh Leading Edge - Fan Exit Case and Vane

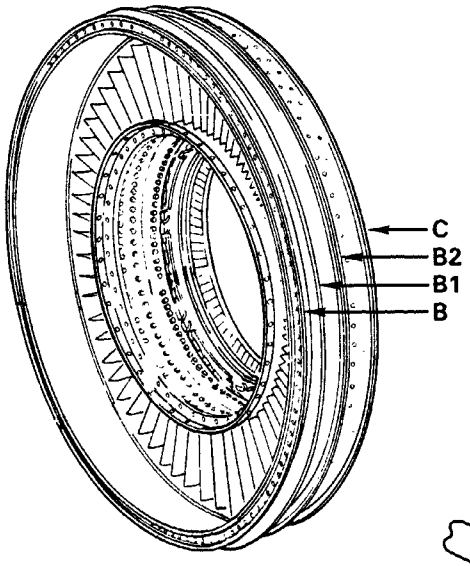
A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	FEGV Repair kit, PN 814765
C. Material No.P05-038	Special Materials (Ref. 70-00-00)
D. Material No.P05-135	Special Materials (Ref. 70-00-00)
E. Material No.P05-147	Special Materials (Ref. 70-00-00)
F. Material No.P05-152	Special Materials (Ref. 70-00-00)
G. Material No.P08-011	Bonding and Adhesive Compounds (Ref. 70-00-00)
H. Material No.P08-016	Bonding and Adhesive Compounds (Ref. 70-00-00)
I. Material No.P08-020	Bonding and Adhesive Compounds (Ref. 70-00-00)
J. Material No.P08-025	Bonding and Adhesive Compounds (Ref. 70-00-00)
K. Material No.P11-014	Cleaning Agents (Ref. 70-00-00)
L.	Grease Pencil
M.	Correct Marker
N.	Sandpaper
P.	Soft Brush
Q.	Shears
R.	Scissors
S.	Tongue Depressor
T.	Spatula
U.	Rubber Hammer
V.	Repair Tool, FEGV Leading Edge Heater, locally Fabricated
Referenced Procedure	
- 71-13-00, P. Block 301	Cowl Doors

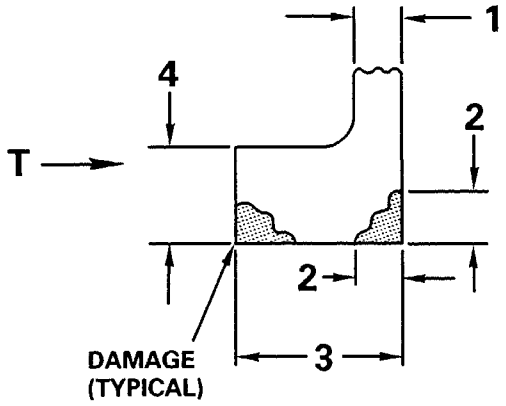
NOTE : Adhesive (Material No.P08-025) is an option to the mixture of Milled Glass (Material No.P05-147), Thickening Agent (Material No.P08-011) or Thickening Agent (Material No.P08-020), Adhesive (Material No.P08-016) is an option to the adhesive in the PN 814765 FEGV repair kit.

B. Job Set-Up
(1)Open fan cowl and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

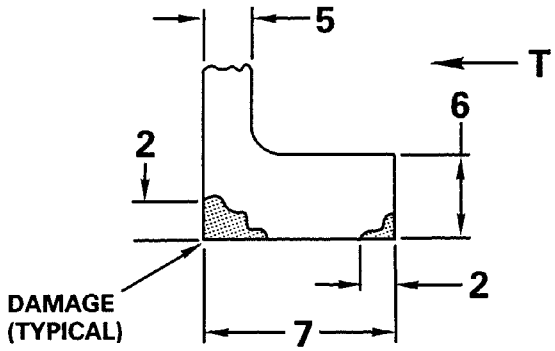




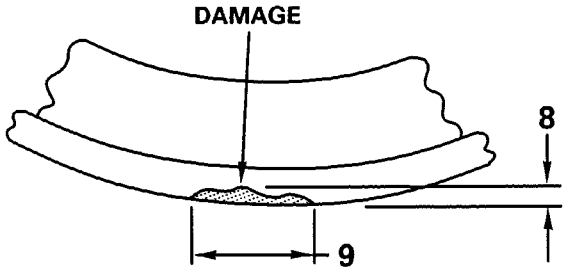
FAN EXIT CASE AND VANE



SECTION THROUGH FLANGE B2



SECTION THROUGH FLANGE B1



VIEW T
(TYPICAL FORWARD OR REAR OF FLANGES B1 AND B2)

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Smooth Damage on the Outer Case Flanges
Figure 809

C. Procedure (Ref. Fig. 810, 811)

NOTE : In this procedure, the words "damage" and "repair area" are not the same thing. The repair area is larger than the damage itself. The repair area includes the total area that you clean, sand, and patch.

(1)Remove the damage as follows :

(a)Tap the damaged area to find out how much delamination there is. An area of delamination has a hollow sound.

(b)Make a mark around the perimeter of the damaged area. Use a grease pencil or other correct marker.

(c)Mechanically remove damaged and loose material, including loose or torn wire mesh. File or sand the edges of the damaged area.

(2)Measure the size of the damaged area. If the area is more than the limits in the referenced figure, you must replace the vane (Ref. Fig. 810).

(3)Clean the repair area and patch as follows :

(a)Clean the repair area with a soft brush and a solution of Wetting Agent (Material No.P05-152) and water. Rinse with water and air dry.

(b)Sand the repair area lightly with 240 - 400 grit sandpaper.

(c)Remove a full length wire mesh leading edge detail from the protective package.

(d)Pre-fit the partial or full length patch over the leading edge and trim to correct length with shears or scissors.

(e)Make a piece of Cheesecloth (Material No.P05-038) moist with Isopropyl Alcohol (Material No.P11-014).
With the Cheesecloth (Material No.P05-038), make the patch clean.

(f)Dry the patch fully at air temperature. There must be no alcohol on the patch when you apply the adhesive.

(g)Clean the repair area. Use the same method and materials that you used with the patch.

(4)Bond the patch to the vane as follows :

(a)Place mylar or teflon tape along the edge of the repair area, approximately 0.600 in. (15.240 mm) from the leading edge and parallel to the leading edge on both sides of the vane airfoil.

(b)Use the adhesive in the Fan Exit Guide Vanes (FEGV) Repair Kit PN 814765 or use optional Adhesive (Material No.P08-025) or as an option mix Adhesive (Material No.P08-016) with 27 - 33 percent (by weight) Milled Glass (Material No.P05-147) and 4 - 6 percent (by weight) Thickening Agent (Material No.P08-011) or (Material No. 08-020). Mix the mixture fully.

NOTE : To mix the adhesive in the cartridge supplied with the FEGV repair kit (P/N 814765) :

1 Insert the ramrod into the open end of the valved rod and apply pressure to release the catalyst into the cartridge.

2 Mix the material by hand for approximately 3 minutes until a uniform adhesive color is observed. Turn the valved rod in a clockwise direction to mix while moving mixing head up and down within the cartridge. If a mixing machine is used, mix for approximately one minute.

3 Remove the ramrod and unscrew the valved rod.

4 Screw in the nozzle and dispense epoxy adhesive by use of either a pneumatic "SEMCO" dispensing gun or by pushing on the cap at the back

of the cartridge.

(c)Put the mixture on both sides of the patch. Use a lot of the mixture. Use a tongue depressor or spatula. Also apply adhesive to the damaged areas on the vane leading edge.

(d)Put the patch on the repair area. The epoxy mixture must not leak from the patch.

(e)Apply the locally fabricated leading edge tool over the leading edge of the vane until it is firmly seated.

Tapping with a rubber hammer is permissible to assist in seating the tool. Hold the tool in place on the vane with tape, cord or some other acceptable method. Wipe any excess adhesive from around the tool (Ref. Fig. 811).

(f)Cure the patch for 24 hours at a minimum ambient temperature of 60 deg.F (15.6 deg.C) or for 90 minutes, minimum, at 140 - 260 deg.F (60 - 127 deg.C). If ambient temperature cure is used, the tool may be removed after 8 hours.

(g)Remove the tools (clamp, tape, etc.).

(5)Blend any unwanted adhesive with 240 - 400 grit sandpaper.
A patch-to-vane mismatch of 0.030 in. (0.762 mm), maximum, is permitted.

D. Close-Up

(1)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

9. Repair the Airfoil of the Vane with a Metal Shield over the Leading Edge - Fan Exit Case and Vane Assembly

R This repair is deleted.

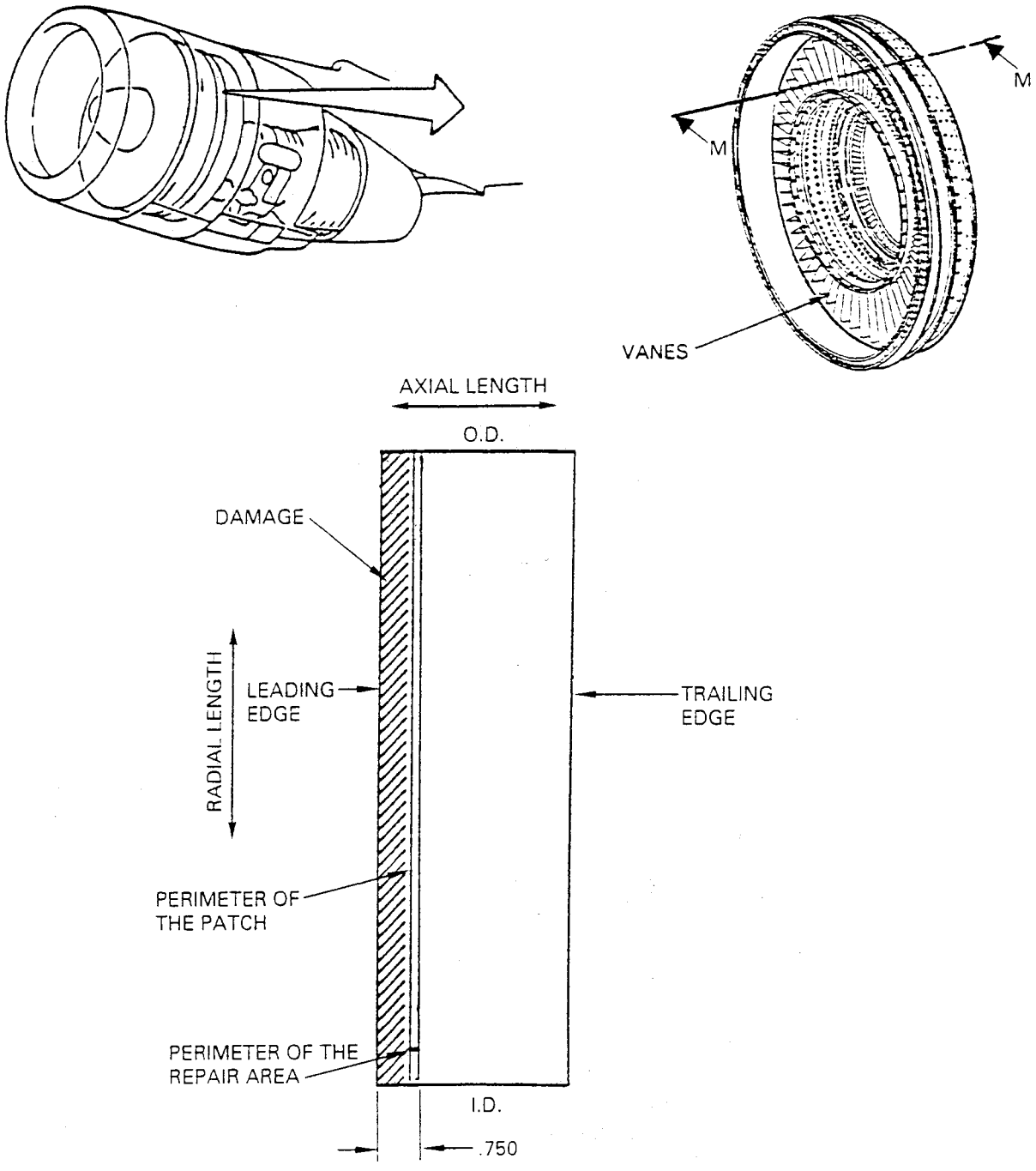
10. Repair The Fan Exit Vane Leading Edge With Tape

A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. Material No.P05-038	Special Materials (Ref. 70-00-00)
B. Material No.P05-076	Special Materials (Ref. 70-00-00)
B. Material No.P05-145	Special Materials (Ref. 70-00-00)
B. Material No.P05-198	Special Materials (Ref. 70-00-00)
B. Material No.P05-153	Special Materials (Ref. 70-00-00)
B. Material No.P05-278	Special Materials (Ref. 70-00-00)
B. Material No.P05-317	Special Materials (Ref. 70-00-00)
B. Material No.P11-014A	Cleaning Agents (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 72-31-02, P. Block 401	First Stage Compressor Stator

B. General

(1)This repair should be applied if the FEGV leading edge (SST Wiremesh Weave) is loose, broken, or missing due to service damage.



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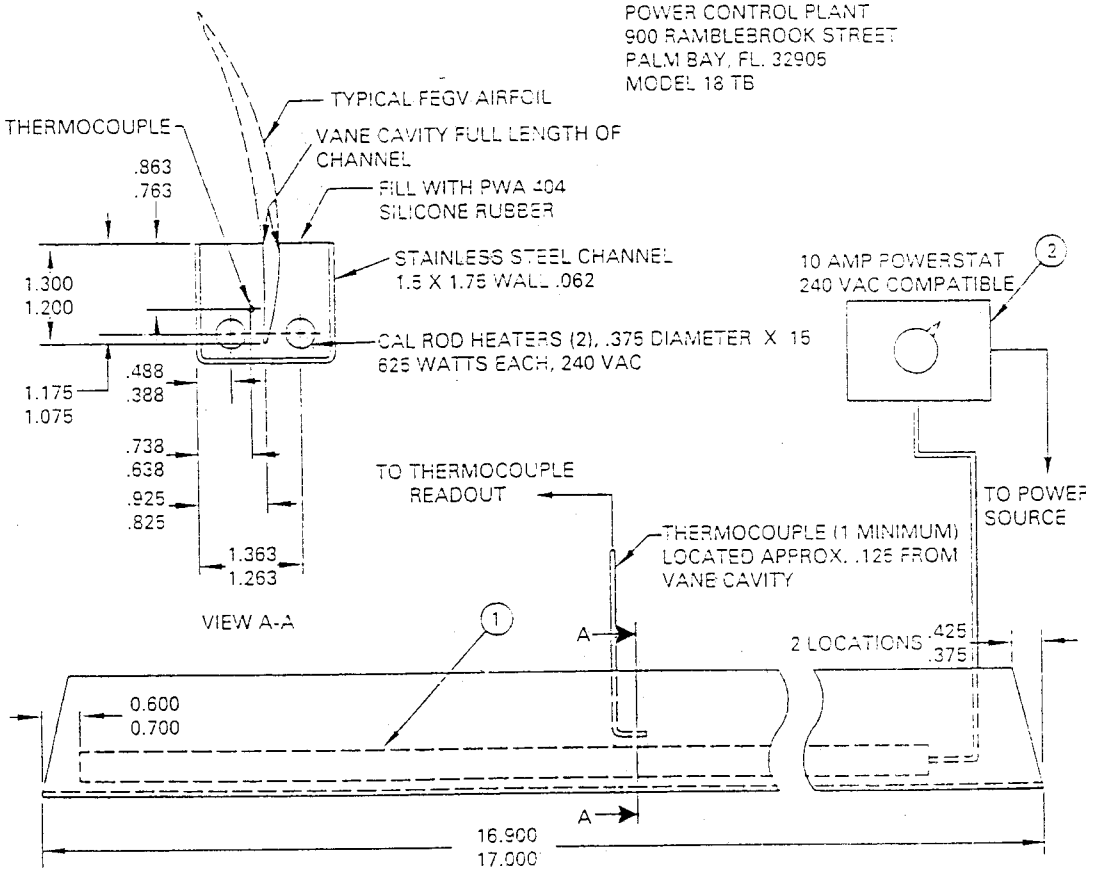
Repair the Wire Mesh Leading Edge of the Vane
Figure 810

FEGV LEADING EDGE REPAIR TOOL

1. CHROMALOX INDUSTRIAL HEATING PRODUCTS
641 ALPHA DRIVE
PITTSBURGH, PA. 15238
CATALOG NO. C-225

2. PAYNE ENGINEERING
POWER CONTROL PLANT
900 RAMBLEBROOK STREET
PALM BAY, FL. 32905
MODEL 18 TB



NOTE: DIMENSIONS ARE GIVEN IN INCHES ONLY

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BM5 72 23 02 8 KTMO 00

Locally Fabricated Leading Edge Heater Tool
Figure 811

(2)Use this repair only if leading edge damage is 0.300 in. (7.620 mm) of the vane airfoil chord or less.
NOTE : Vanes with damage greater than 0.300 in. (7.620 mm) must be replaced. Refer to paragraph 4.
(3)FEGV's repaired by this procedure which show tape deterioration can be repaired again. All old tape must be removed before the application of the new tape repair.

C. Job Set-Up
(1)Open, safety and tag circuit breakers for the appropriate engine and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)If necessary, remove stage 1 LPC (fan) blades (Ref. 72-31-02, P. Block 401).

D. Procedure (Ref. Fig. 812)
(1)Find the leading edge of the fan exit vane that can be repaired.
(2)Remove the leading edge damage as follows :
(a)Sand repair area lightly with 240 grit (Material No.P05-153) or 400 grit Abrasive Paper (Material No.P05-076) to remove any sharp edges.
(b)Sand repair area lightly with Abrasive Paper 240 grit (Material No.P05-153) or 400 grit (Material No.P05-076) to remove any loose material.
(c)Apply Masking Tape (Material No.P05-145) to a 1.00 in. (25.400 mm) wide area from both sides of the leading edge.
(3)Prepare the leading edge for Polyurethane Tape (Material No.P05-278) application as follows :
(a)Sand within masked area with Abrasive Paper 240 grit (Material No.P05-153) or 400 grit (Material No.P05-076).
(b)Remove the Masking Tape (Material No.P05-145).
(c)Clean the repair area with Unsized Cheesecloth (Material No.P05-038) and isopropyl alcohol (Material No.P11-14A).
(d)Allow to air dry for 15 minutes.
NOTE : The cleaning process is important to the tape adhering to the vane during service operation.
NOTE : It is important to keep the surfaces that are bonded free from contamination. Use Plastic Polyethylene Gloves (Material No.P05-198) to help prevent surface contamination.
(4)Apply Adhesion Promoter (Material No.P05-317) to the leading edge repair area as follows :
(a)Use Unsized Cheesecloth (Material No.P05-038) wetted with a minimum amount Adhesive Promoter (Material No.P05-317) and apply to the repair area.
(b)Allow to air dry for 10 minutes or until surface is not glossy.
NOTE : Protective Polyurethane Tape (Material No.P05-278) applications over Adhesive Promoter (Material No.P05-317) will be more difficult to remove.
(5)Apply Protective Polyurethane Tape (Material No.P05-278) as follows :
NOTE : You must complete apply the Protective Polyurethane Tape (Material No.P05-278) within one hour of the application of the adhesive promoter (Material No.P05-317).
(a)Mark the installation edge of the Protective Polyurethane Tape

(Material No.P05-278) as follows :

1 Apply Masking Tape (Material No.P05-145) to a 0.75 in. (19.050 mm) wide area from both sides of the leading edge.

(b)Cut the Protective Polyurethane Tape (Material No.P05-278) to a width of 1.5 in. (38.100 mm).

(c)Cut the protective Polyurethane Tape (Material No.P05-278) to a length of 0.50 in. (12.700 mm) to 0.75 in. (19.050 mm) less than the radial height of the vane leading edge.

(d)Remove the paper backing from the Protective Polyurethane Tape (Material No.P05-278).

NOTE : Be careful not to allow tape adhesive side to attach to itself.

(e)Align one edge of the Protective Polyurethane Tape (Material No.P05-278) and put against the edge of the Masking Tape (Material No.P05-145).

(f)Carefully apply the Protective Polyurethane Tape (Material No.P05-278) forward to the leading edge.

1 Make the tape smooth.

2 Pull the tape around the leading edge.

3 Continue to apply tape to the other side of the vane.

4 Make the tape smooth to follow the vane contour.

NOTE : If tape becomes wrinkled or is applied incorrectly, discard and apply new tape immediately.

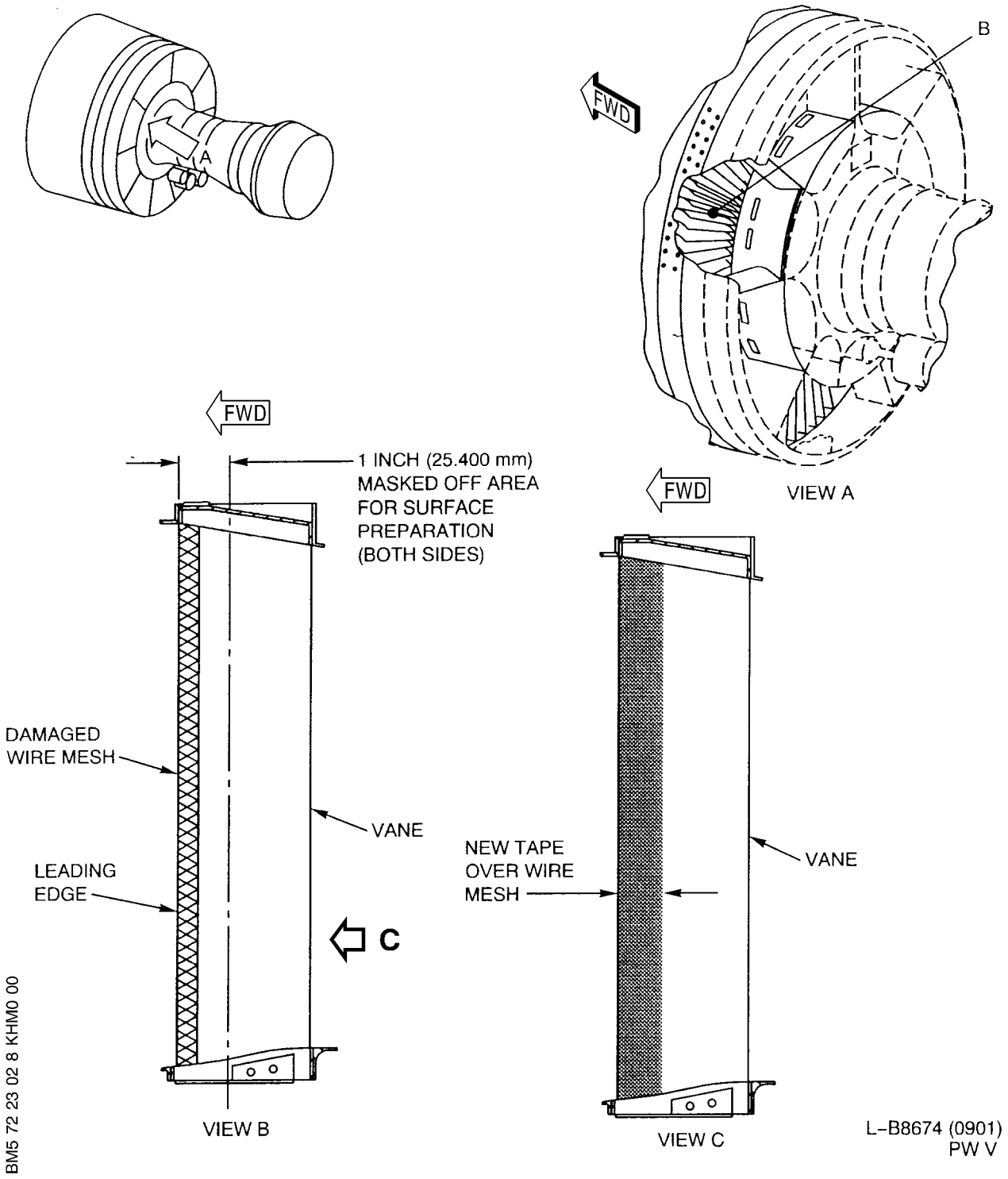
CAUTION : INSTALLED APPEARANCE OF THE TAPE MUST BE SMOOTH AGAINST THE VANE SURFACE. FAILURE TO INSURE THAT THE TAPE IS SMOOTH CAN CAUSE THE TAPE TO TEAR OR TO BE UNSERVICEABLE.

(g)Remove the Masking Tape (Material No.P05-145).

D. Close-Up

(1)If necessary, install stage 1 LPC (fan) blades (Ref. 72-31-02, P.Block 401).

(2)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).



Fan Exit Guide Vane Tape Leading Edge Repair
Figure 812

11. Repair the Airfoil of the Vane with a Full Replacement of Metal Leading Edge or Wire Mesh

A. Equipment and Materials

ITEM	DESIGNATION
(1)	Circuit Breaker Safety Clips
(2)Material No.P05-018	Special Materials (Ref. 70-00-00)
(3)Material No.P05-038	Special Materials (Ref. 70-00-00)
(4)Material No.P05-145	Special Materials (Ref. 70-00-00)
(5)Material No.P05-147	Special Materials (Ref. 70-00-00)
(6)Material No.P05-153	Special Materials (Ref. 70-00-00)
(7)Material No.P05-182	Special Materials (Ref. 70-00-00)
(8)Material No.P05-198	Special Materials (Ref. 70-00-00)
(9)Material No.P05-360	Special Materials (Ref. 70-00-00)
(10)Material No.P05-361	Special Materials (Ref. 70-00-00)
(11)Material No.P08-025	Bonding and Adhesive Compounds (Ref. 70-00-00)
(12)Material No.P08-044	Bonding and Adhesive Compounds (Ref. 70-00-00)
(13)Material No.P11-014A	Cleaning Agents (Ref. 70-00-00)
R Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

NOTE : The part numbers of the leading edge shields are 53D011 and 52D705.

B. Job Set-Up
(1)Open fan cowl and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure (Ref. Fig. 813, 814)
(1)Find the leading edge of the fan exit vanes that can be repaired.
(2)Remove the leading edge damage as follows :
(a)Remove leading edge damage. For the applicable repair area (Ref. Fig. 813).
1 Use a smooth file or Sand Paper (Material No.P05-153) to remove any material in the repair area that is above the adjacent area with no damage.
2 Use a smooth file or Sand Paper (Material No.P05-153) and remove any lose material that is under the wire mesh.
3 Remove all the old rubber adhesive materials (Viton Coating and Old Lord) where the metal shield or wire mesh will be installed.
NOTE : The presence of any old coating or adhesive can result in not sufficient bonding where the metal shield or wire mesh will be installed.
Do not remove erosion coating aft of the leading edge.
4 Use Sand Paper (Material No.P05-153) and remove any contamination or glaze in the repair area.
(3)Prepare the repair area by one of the procedures that follow.
(a)If metal leading edge shield is to be used for the repair:
1 Temporarily, install the applicable metal shield on the vane leading

edge and do a check for correct tight fit as follows. For correct leading edge shield location (Ref. Fig. 814).

NOTE : There is one camber for the metal leading edge shield. Use this shield for all camber classes of fan exit guide vanes.

- If necessary, make a slight bend or pinch the leading edge shield to get the correct tight fit.

2 With the leading edge shield fully against the vane leading edge, use the Marking Pencil (Material No.P05-018) to make a permanent mark on the vane surface where the leading edge shield stops. Make sure that all rubber type adhesive has been removed.

3 Remove the leading edge shield from the fan exit guide vane.

CAUTION : IT IS IMPORTANT TO KEEP THE SURFACES THAT ARE BONDED FREE FROM CONTAMINATION. USE PLASTIC POLYETHYLENE GLOVES (MATERIAL NO.P05-198) TO HELP PREVENT SURFACE CONTAMINATION.

R

4 Clean the fan exit guide vane and the leading edge shield.

- Make a Cheesecloth (Material No.P05-038) moist with Isopropyl Alcohol (Material No.P11-014A). Clean the leading edge repair area of the exit guide vane and the inner area of the metal shield.
- Let the surface fully air dry for 15 minutes.

(b)If wire mesh is to be used for the repair:

1 Remove a full length wire mesh leading edge detail from the protective package.

2 With no adhesive, apply the wire mesh patch over the leading edge. Trim the wire mesh to the correct length with scissors or shears. Make sure that all rubber type adhesive has been removed.

CAUTION : IT IS IMPORTANT TO KEEP THE SURFACES THAT ARE BONDED FREE FROM CONTAMINATION. USE PLASTIC POLYETHYLENE GLOVES (MATERIAL NO.P05-198) TO HELP PREVENT SURFACE CONTAMINATION.

3 Clean the wire mesh patch with cheesecloth (Material No.P05-038) moistened with alcohol (Material No.P11-014A).

4 Let the wire mesh patch fully dry at air temperature. There must be no alcohol on the wire mesh patch when you apply the adhesive.

5 Clean the repair area of the vane with cheesecloth (Material No.P05-038) moistened with alcohol (Material No.P11-014A).

(4)Prepare one of the following adhesives.

(a)Prepare epoxy adhesive (Material No.P08-025 or P08-044) to the instructions provided by the manufacturer.

(5)Bond the leading edge shield to the leading edge of the fan exit guide vane as follows. Use one of the epoxy adhesive pastes, (Material No.P08-025 or P08-044) (Ref. Fig. 814) for the correct bond application areas.

(a)Apply the epoxy adhesive paste (Material No.P08-025 or P08-044) along the entire length of the vane repair area.

(b)Apply the epoxy adhesive paste (Material No.P08-025 or P08-044) along the entire length of the leading edge shield.

(c)Pull the leading edge shield over the leading edge of the fan exit guide vane.

(6)Bond the wire mesh patch to the vane as follows:

(a)Place mylar or teflon tape along the edge of the repair area, approximately 0.600 in. (15.240 mm) from the leading edge and parallel to the leading edge on both sides of the vane airfoil.

(b)Apply the epoxy adhesive paste on both sides of the patch. Use a tongue depressor or equivalent to push the adhesive in the wire mesh until the wire mesh is filled with adhesive. Also apply adhesive to the damaged areas on the vane leading edge.

(c)Put the patch on the repair area. The epoxy mixture must squeeze out beyond the patch.

(7)Use the Cheesecloth (Material No.P05-038) and remove any unwanted urethane adhesive from the leading edge shield or wire mesh and vane surfaces.

(a)The adhesive must be made smooth between the edges of the leading edge shield or wire mesh and the vane surface all around.

(8)Tightly wind several lengths of Masking Tape (Material No.P05-0145) at three locations around the vane cord.

NOTE : This will hold the leading edge shield or wire mesh in position.

(9)If necessary, use the Cheesecloth (Material No.P05-038) and again remove any unwanted urethane adhesive from the leading edge shield and vane surfaces.

(10)Cure the adhesive on the fan exit guide vane as follows:

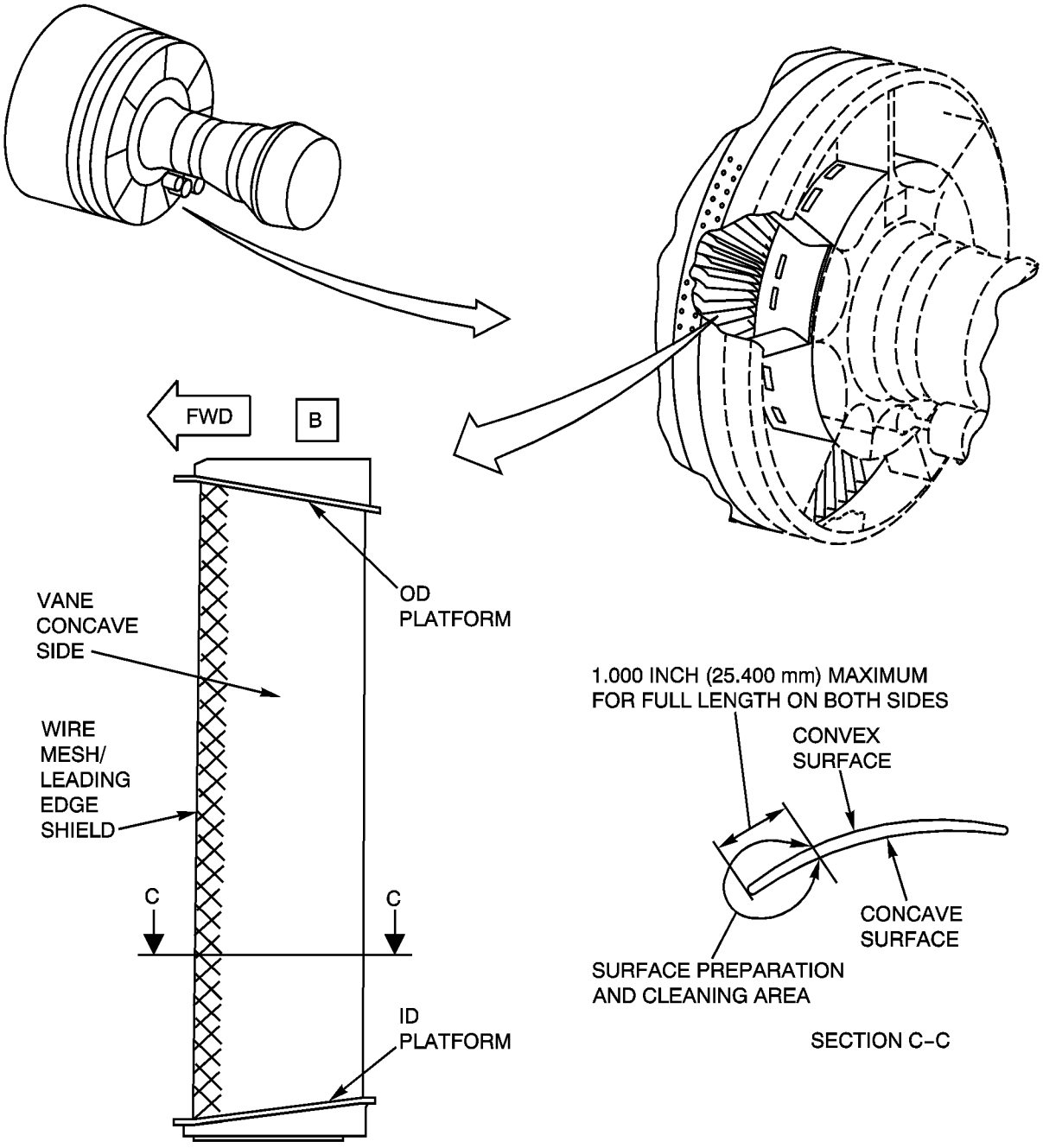
(a)Let the fan exit guide vane cure at a room temperature for 4 hours minimum followed by 150°F - 180°F (65.6°C - 82.2°C) for 2 hours minimum.

(11)Remove the Masking Tape (Material No.P05-145) from the three locations around the vane cord.

(12)Do a check for a complete bond between the leading edge shield or wire mesh and the fan exit guide vane.

D. Close-Up

R (1)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).



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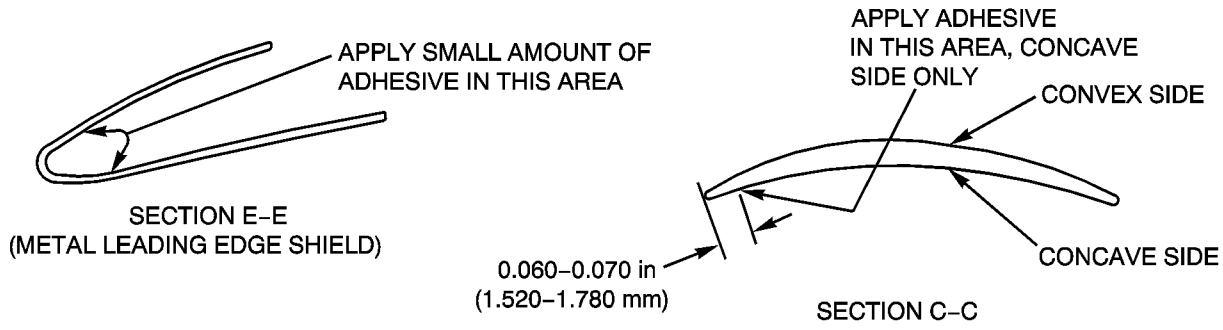
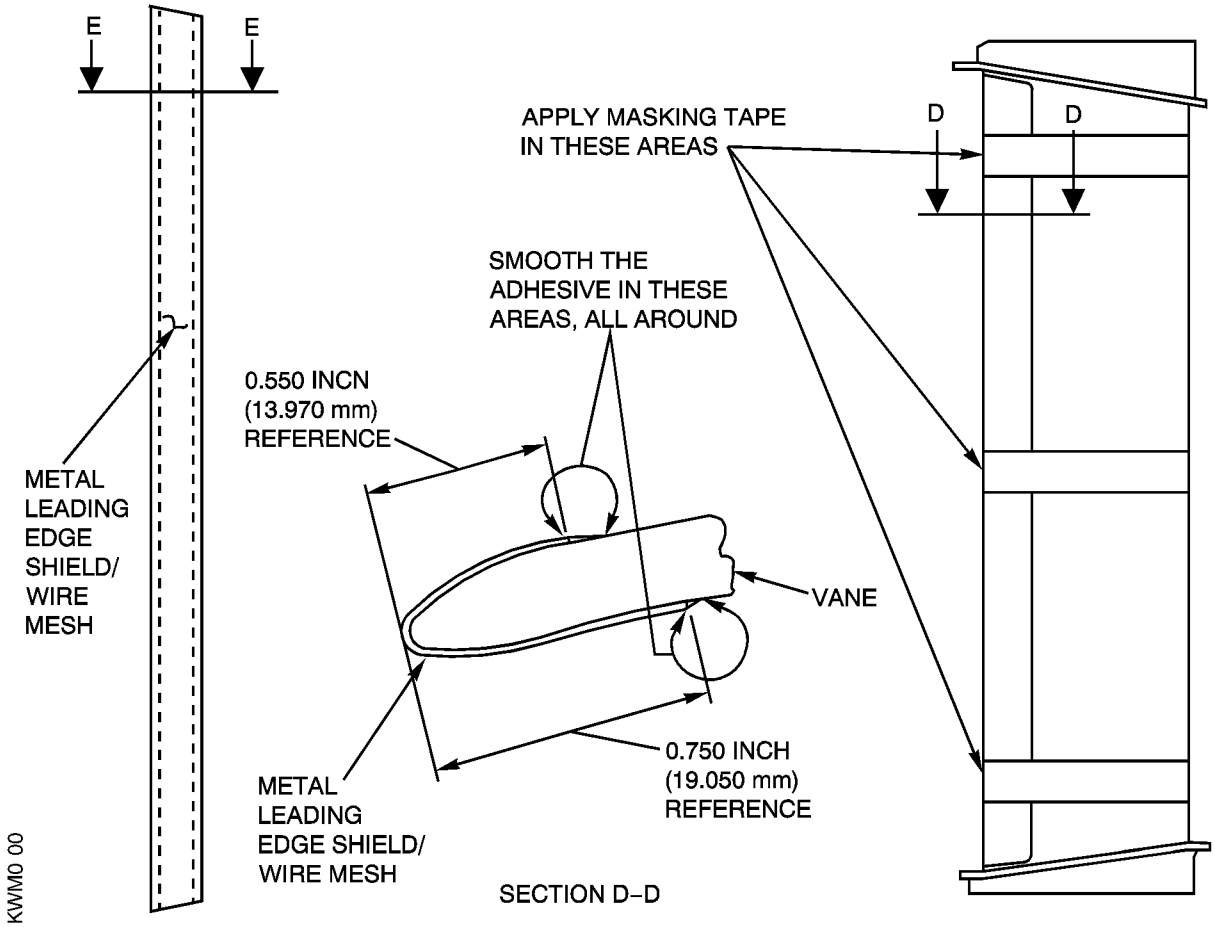
L-D3255 (0306)
PW V

R Surface Preparation for Leading Edge Shield Repair
Figure 813





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L-D3256 (0306)
PW V

R Bond Areas for Leading Edge Shield Repair
Figure 814

1. Removal/Installation of Fan Exit Liner Segments (Inner Rear)

A. Procedure to use with the removal/installation of a component (Pre SB
R PW4ENG 72-519).
(1)Equipment and materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C. Material No.P03-001	Oils (Ref. 70-00-00)
D. Material No.P05-038	Special Materials (Ref. 70-00-00)
E. Material No.P05-137	Special Materials (Ref. 70-00-00)
F. Material No.P05-231	Special Materials (Ref. 70-00-00)
G. Material No.P09-014	Sealants (Ref. 70-00-00)
H. Material No.P09-019	Sealants (Ref. 70-00-00)
I. Material No.P09-029	Sealants (Ref. 70-00-00)
J. Material No.P11-014	Cleaning Agents (Ref. 70-00-00)
K. Material No.P18-007	Primer (Ref. 70-00-00)
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

(2)Job Set-Up
(a)Open, safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(b)Install access platform.
(3)Removal (Ref. Fig. 404)
NOTE : Use this procedure if you will install the same liner that you removed. Use the procedure in paragraph 1. B. to replace a liner, spacer plate, or washers.
(a)If applicable, cut the sealant at the axial edge of the liner.
CAUTION : BE VERY CAREFUL WHEN YOU REMOVE OR INSTALL A LINER SEGMENT. THE WASHERS THAT ARE ATTACHED TO THE FRONT LINER BRACKET CAN BECOME DISCONNECTED FROM THE BRACKET. ALSO, IF THE EDGE OF THE LINER SEGMENT HITS SOMETHING, IT CAN DELAMINATE.
(b)Remove the liner as follows :
NOTE : It is possible that classified washers are installed between the liner and the attachment bracket at the front center of the liner. Washers are attached to the bracket with sealant. It is possible that during engine operation the washers can become disconnected from the bracket. This is also possible when you remove or install the screws or bolts that attach the liner to the bracket.
1 (Non-acoustical liners) Remove screws (pre SB PW4 ENG 72-107) or bolts (post SB PW4 ENG 72-107) that attach the inner liner to the case and vane assembly.
Carefully remove the liner from the case.
2 (Acoustical liners) It is necessary to first remove the sealant that

covers the screws, and then remove the screws. Use mechanical means to remove the sealant. Be careful not to damage the engine parts.

3 If applicable, mechanically remove the sealant from the axial edge of the liner and its mating parts.

(c)If the liner is not attached to the case, keep the spacer plate (called spacer) with the liner.

NOTE : Use this procedure if you will install the same liner that you removed. Use the procedure in paragraph 1. B. to replace a liner spacer plate, or washers.

(4)Installation

CAUTION : ACOUSTICAL AND NON-ACOUSTICAL LINERS ARE IN SETS.

(a)Install the liner as follows.

CAUTION : BE VERY CAREFUL WHEN YOU REMOVE OR INSTALL A LINER SEGMENT. THE WASHERS THAT ARE ATTACHED TO THE FRONT LINER BRACKET CAN BECOME DISCONNECTED FROM THE BRACKET. ALSO, IF THE EDGE OF THE LINER SEGMENT HITS SOMETHING, IT CAN DELAMINATE.

1 Install two screws/bolts, threads lubricated with Material No.P03-001 to holes in the leading edge of the liner. Put the liner in position on the case. Tighten the screws/bolts with your hand. Engines with non-acoustical liners (Ref. Fig. 401). Engines with acoustical liners (Ref. Fig. 402).

NOTE : Screws are pre SB PW4ENG 72-107. Bolts are post SB PW4ENG 72-107. The 6 o'clock liner does not use bolts/screws at the leading edge.

2 If loose, put the spacer in position at the trailing edge.

3 Install screws/bolts, threads lubricated with Material No. P03-001, in the trailing and axial edges of the liner. Tighten the screws/bolts with your hand.

4 TORQUE all the screws/bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN) in the sequence that follows :
- Front fasteners.
- Rear fasteners.
- Axial fasteners.

5 Visually examine each fastener to be sure that it touches the washers. If it does not touch the washer, remove it, apply new lubricant, and install it again.

NOTE : It is not necessary for the fastener to be symmetrically installed in the recess.

(b)For engines with the acoustical fan exit liner segment assemblies (inner rear), use one of the methods that follow to fill the screw holes in the liners (Ref. Fig. 402).

NOTE : The liner at 6 o'clock is a non-acoustical liner.

1 First method :
- Clean the screw heads and holes with Material No.P11-014.
- Cover the screw heads only with Material No.P09-029.
- Fill the outer part of the holes and an area approximately 0.125 in. (3.175 mm) larger than the hole with Material No.P09-014.

2 Second method :
- Cover the screw heads with Material No.P05-231 film side-up.
- Clean the holes with Material No.P11-014.
- Fill the outer part of the holes and an area approximately 0.125 in.

(3.175 mm) larger than the hole with Material No.P09-014.

3 Third method :
- Cover the screw heads with Material No.P05-137. Cure at 400°F (204.4°C) for one hour.
- Clean the holes with Material No.P11-014.
- Fill the outer part of the holes and an area approximately 0.125 in. (3.175 mm) larger than the hole with Material No.P09-014.

4 Fourth method :
- Fill the screw holes with AMS 7267 or AMS 7276 packing material.
- Clean the packing material and holes with Material No.P11-014.
- Fill the outer part of the holes and an area approximately 0.125 in. (3.175 mm) larger than the hole with Material No.P09-014.

(c)If you installed a liner at 11 o'clock or 1 o'clock, apply sealant to Area AL (Ref. Fig. 403).

1 Clean the areas the sealant will touch. Use a piece of Material No.P05-038 that is moist with Material No.P11-014.

2 Apply Material No.P18-007 to all cleaned surfaces.
- It is necessary to apply the primer in less than two hours after you cleaned the area.
- The primer must cure in air that is at ambient temperature for two hours, minimum. The air must have a relative humidity of 25 percent, minimum.

3 Apply Material No.P09-019
- It is necessary to apply the sealant from 2 - 24 hours after you applied the primer.
- Use a hot air gun at 175° - 225°F (79° - 107°C) for 5 - 7 minutes to dry the sealant.
- After the hot air gun, cure the sealant in air that has a relative humidity of 25 percent, minimum, for eight hours, minimum, before you touch the parts.

(5)Close-up

(a)Remove access platform.

(b)Close the thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

(c)Remove safety clips and tags and close circuit breakers.

B. Procedure to use with the removal/installation of a component (Post SB
R PW4ENG 72-519).

(1)Equipment and materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C. Material No.P03-001	Oils (Ref. 70-00-00)
D. Material No.P05-038	Special Materials (Ref. 70-00-00)
E. Material No.P05-231	Special Materials (Ref. 70-00-00)
F. Material No.P09-014	Sealants (Ref. 70-00-00)
G. Material No.P09-019	Sealants (Ref. 70-00-00)
H. Material No.P11-014	Cleaning Agents (Ref. 70-00-00)
I. Material No.P18-007	Primer (Ref. 70-00-00)

Referenced Procedure

ITEM	DESIGNATION
- 71-13-00, P. Block 301	Cowl Doors

(2)Job Set-Up
(a)Open, safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(b)Install access platform.
(3)Removal (Ref. Fig. 404)
NOTE : Use this procedure if you will install the same liner that you removed. Use the procedure in paragraph 1. B. to replace a liner, or washers.
(a)If applicable, cut the sealant at the axial edge of the liner.
CAUTION : BE VERY CAREFUL WHEN YOU REMOVE OR INSTALL A LINER SEGMENT. THE WASHERS THAT ARE ATTACHED TO THE FRONT LINER BRACKET CAN BECOME DISCONNECTED FROM THE BRACKET. ALSO, IF THE EDGE OF THE LINER SEGMENT HITS SOMETHING, IT CAN DELAMINATE.
(b)Remove the liner as follows :
NOTE : It is possible that classified washers are installed between the liner and the attachment bracket at the front center of the liner. Washers are attached to the bracket with sealant. It is possible that during engine operation the washers can become disconnected from the bracket. This is also possible when you remove or install the screws that attach the liner to the bracket.
1 It is necessary to first remove the sealant that covers the screws, and then remove the screws. Use mechanical means to remove the sealant. Be careful not to damage the engine parts.
2 If applicable, mechanically remove the sealant from the axial edge of the liner and its mating parts.
(4)Installation
NOTE : Use this procedure if you will install the same liner that you removed. Use the procedure in paragraph 1. B. to replace a liner, or washers.
(a)Install the liner as follows.
CAUTION : BE VERY CAREFUL WHEN YOU REMOVE OR INSTALL A LINER SEGMENT. THE WASHERS THAT ARE ATTACHED TO THE FRONT LINER BRACKET CAN BECOME DISCONNECTED FROM THE BRACKET. ALSO, IF THE EDGE OF THE LINER SEGMENT HITS SOMETHING, IT CAN DELAMINATE.
1 Install two screws, threads lubricated with Material No.P03-001 to holes in the leading edge of the liner. Put the liner in position on the case. Tighten the screws with your hand.
(Ref. Fig. 402).
NOTE : The 6 o'clock liner does not use bolts at the leading edge.
2 If loose, put the spacer in position at the trailing edge.
3 Install screws, threads lubricated with Material No. P03-001, in the trailing and axial edges of the liner. Tighten the screws with your hand.
4 TORQUE all the screws to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN) in the sequence that follows :

- Front fasteners.
- Rear fasteners.
- Axial fasteners.

5 Visually examine each fastener to be sure that it touches the washer. If it does not touch the washer, remove it, apply new lubricant, and install it again.

NOTE : It is not necessary for the fastener to be symmetrically installed in the recess.

(b)Fill the screw holes with the method that follows. (Ref. Fig. 402)

NOTE : The liner at 6 o'clock is a non-acoustical liner.

1 Cover the screw heads with Material No.P05-231, film side-up.

2 Clean the holes with Material No.P11-014.

3 Fill the outer part of the holes and an area approximately 0.125 in. (3.175 mm) larger than the hole with Material No.P09-014.

(c)If you installed a liner at 11 o'clock or 1 o'clock, apply sealant to Area AL (Ref. Fig. 403).

1 Clean the areas the sealant will touch. Use a piece of Material No.P05-038 that is moist with Material No.P11-014.

2 Apply Material No.P18-007 to all cleaned surfaces.

- It is necessary to apply the primer in less than two hours after you cleaned the area.
- The primer must cure in air that is at ambient temperature for two hours, minimum. The air must have a relative humidity of 25 percent, minimum.

3 Apply Material No.P09-019

- It is necessary to apply the sealant from 2 - 24 hours after you applied the primer.
- Use a hot air gun at 175° - 225°F (79° - 107°C) for 5 - 7 minutes to dry the sealant.
- After the hot air gun, cure the sealant in air that has a relative humidity of 25 percent, minimum, for eight hours, minimum, before you touch the parts.

(5)Close-up

(a)Remove access platform.

(b)Close the thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

(c)Remove safety clips and tags and close circuit breakers.

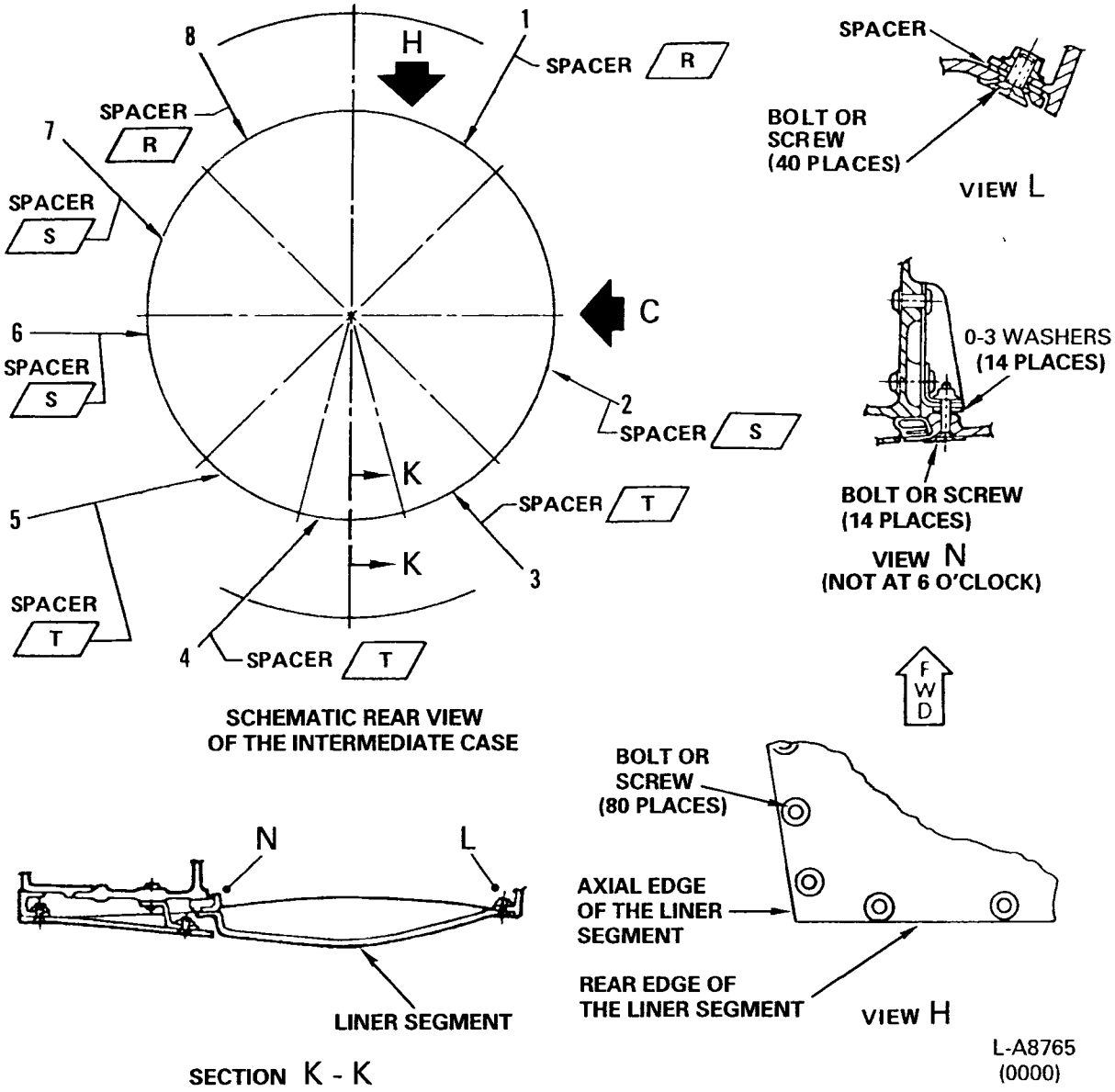
R C. Procedure to use with the replacement of a liner (Pre SB PW4ENG 72-519).

(1)Equipment and materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C. Material No.P03-001	Oils (Ref. 70-00-00)
D. Material No.P05-038	Special Materials (Ref. 70-00-00)
E. Material No.P05-099	Special Materials (Ref. 70-00-00)
F. Material No.P05-133	Special Materials (Ref. 70-00-00)
G. Material No.P05-137	Special Materials (Ref. 70-00-00)
H. Material No.P05-231	Special Materials (Ref. 70-00-00)
I. Material No.P09-014	Sealants (Ref. 70-00-00)

ITEM	DESIGNATION
J. Material No.P09-019	Sealants (Ref. 70-00-00)
K. Material No.P09-027	Sealants (Ref. 70-00-00)
L. Material No.P09-029	Sealants (Ref. 70-00-00)
M. Material No.P11-014	Cleaning Agents (Ref. 70-00-00)
N. Material No.P18-007	Primer (70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-13-00, P. Block 301	Cowl Doors

(2)Job Set-Up
(a)Open, safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(b)Install access platform.
(3)Removal (Ref. Fig. 404)
NOTE : Use this procedure to replace a liner. Use the procedure in paragraph 1. A., if you will install the same liner, you removed.
(a)If applicable, cut the sealant at the axial edge of the liner.
CAUTION : BE VERY CAREFUL WHEN YOU REMOVE OR INSTALL A LINER SEGMENT. THE WASHERS THAT ARE ATTACHED TO THE FRONT LINER BRACKET CAN BECOME DISCONNECTED FROM THE BRACKET. ALSO, IF THE EDGE OF THE LINER SEGMENT HITS SOMETHING, IT CAN DELAMINATE.
(b)Remove the liner as follows.
NOTE : It is possible that classified washers are installed between the liner and the attachment bracket at the front center of the liner. Washers are attached to the bracket with sealant. It is possible that during engine operation, the washers can become disconnected from the bracket. This is also possible when you remove and install the screws or bolts that attach the liner to the bracket.
1 (Non-acoustical liners) Remove the screws (pre SB PW4ENG 72-107) or bolts (post SB PW4ENG 72-107) that attach the inner liner to the case and vane assembly. Carefully remove the liner from the case.
2 (Acoustical liners) It is necessary to first remove the sealant that covers the screws and then remove the screws. Use mechanical means to remove the sealant. Be careful not to damage the engine parts.
3 If applicable, mechanically remove the sealant from the axial edge of the liner and its mating parts.
(c)If the spacer plate (called spacer) is attached to the case, do not remove it.
(4)Installation
NOTE : Use this procedure to install a new liner, washers, or spacers, etc. Use the procedure in paragraph 1.A. to install the same liner you removed.
CAUTION : ACOUSTICAL AND NON-ACOUSTICAL LINERS ARE IN SETS.
(a)(Reference 1005) Find the washer thickness necessary to make a 0.005 - 0.020 in. (0.127 - 0.508 mm) thick empty space between the washers and liner as follows (Ref. Fig. 407).
1 Attach 0.020 in. (0.508 mm) shim stock to the OD of the bracket with



1. SEE PPIPC FOR LINER ASSEMBLY PN
2. SEE PPIPC FOR LINER ASSEMBLY PN
3. SEE PPIPC FOR LINER ASSEMBLY PN
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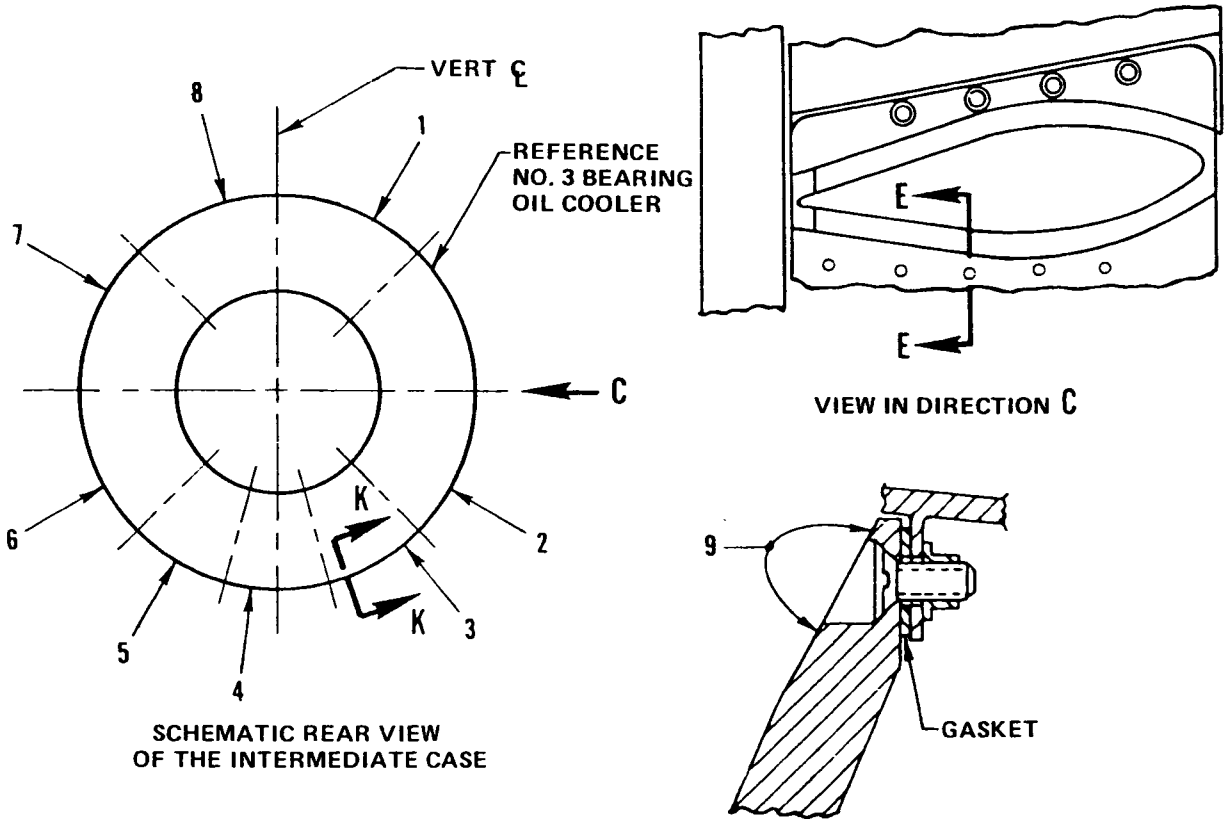
7. SEE PPIPC FOR LINER ASSEMBLY PN
8. SEE PPIPC FOR LINER ASSEMBLY PN

BM5 72 23 05 4 KJM0 03

Installation of the Fan Exit Liner Segment Assemblies
(Non-acoustical liners)
Figure 401



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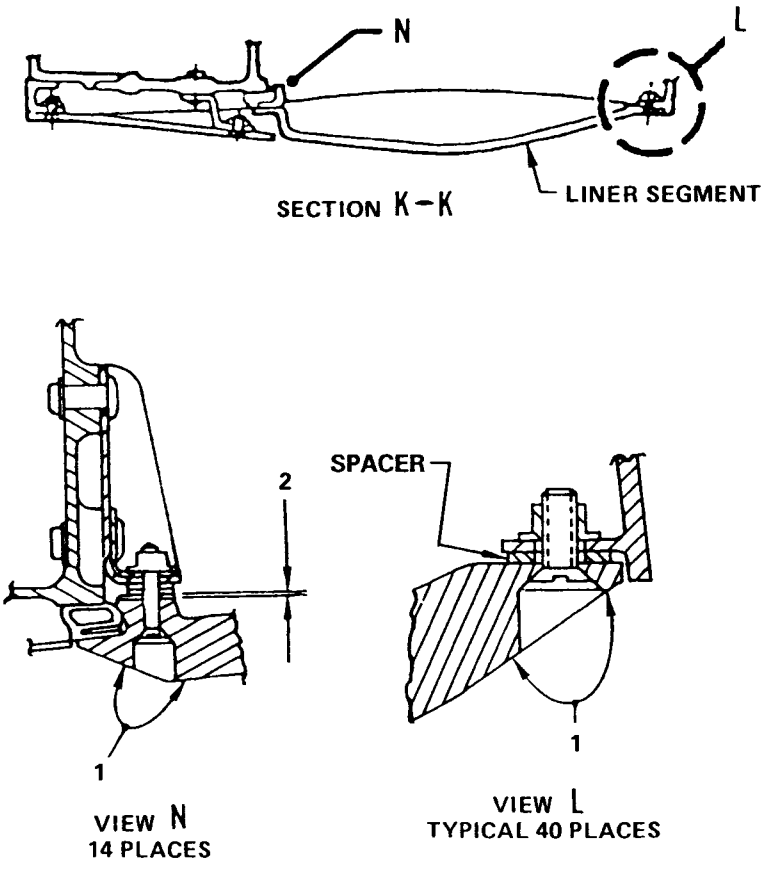
6. SEE PPIPC FOR LINER ASSEMBLY PN
7. SEE PPIPC FOR LINER ASSEMBLY PN
8. SEE PPIPC FOR LINER ASSEMBLY PN
9. THE AREA OF SEALANT

BM5 72 23 05 4 KASA 06

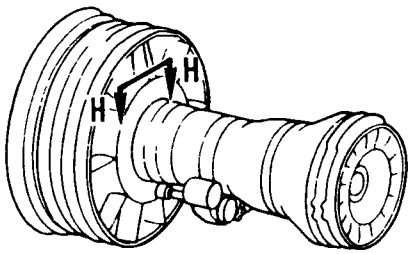
Installation of the Fan Exit Liner Segment Assembly
(Acoustical Liners) (Sheet 1/2)
Figure 402

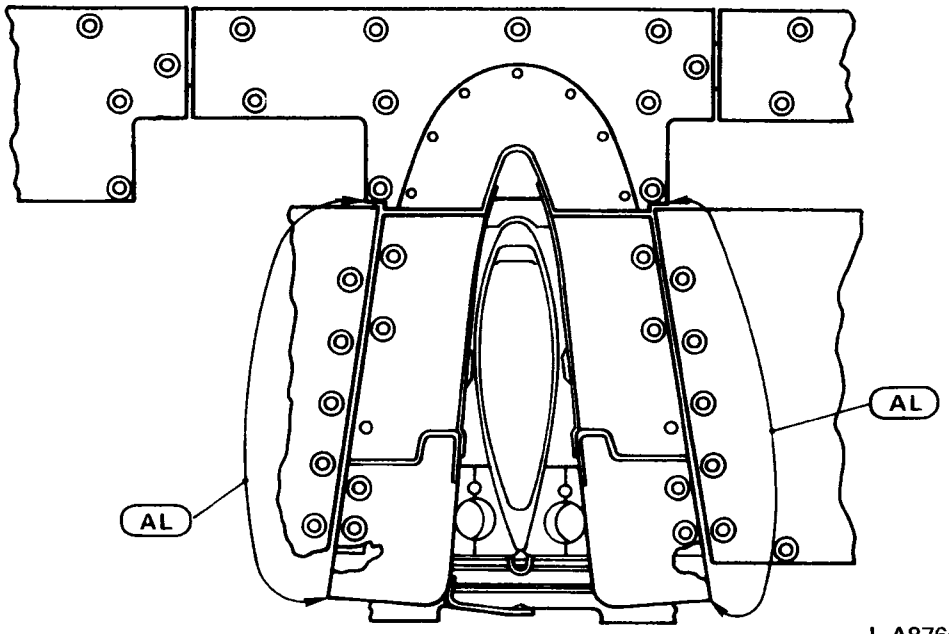


BM5 72 23 05 4 KASC 01

1. The Area of Sealant .
2. (Reference) 0.005 - 0.020 inch. (0.13 - 0.51 mm)

Installation of the Fan Exit Liner Segment Assembly
(Acoustical Liners) (Sheet 2/2)
Figure 402





BM5 72 23 05 4 KLMO 00

Sealant Areas at the Fan Exit Inner
(Bifurcation) Fairing
Figure 403

Material No.P05-099.

CAUTION : BE VERY CAREFUL WHEN YOU REMOVE OR INSTALL A LINER SEGMENT. IF THE EDGE OF THE LINER SEGMENT HITS SOMETHING, IT CAN DELAMINATE.

2 Temporarily attach the liner to the case with screws or bolts.

3 With a depth micrometer in the two forward holes, measure the depth from the top surface of the liner to the surface of the shim stock (Dimension A).

4 Remove the liner and shim stock.

5 Measure the thickness of the liner (Dimension B).

6 Subtract Dimension B from Dimension A to know the necessary thickness of the washers.

7 Use table 401 to choose the correct washer classification. Zero to three washers are necessary.

Class	Washer Thickness - In (mm)
1	0.009 - 0.011 (0.229 - 0.279)
2	0.019 - 0.021 (0.483 - 0.503)
3	0.029 - 0.031 (0.737 - 0.787)
4	0.039 - 0.041 (0.991 - 1.041)
5	0.049 - 0.051 (1.244 - 1.295)
6	0.099 - 0.101 (2.514 - 2.565)

Washer Thickness
Table 401

(b)Attach the washers to the bracket, as follows :

1 With a piece of Material No.P05-038 that is moist with a SPOP 208 solvent (Ref. 70-00-00, P. Block 201), wipe the areas you will bond.

2 Dry the areas fully in air that is at ambient temperature. When dry, there must be no solvent on the parts.

3 Apply Material No.P09-014 to the edges of the washers. Do not apply sealant to the mating surfaces of the washer and bracket. Use screws/ bolts to temporarily hold the washers in position.

(c)Find the correct classification of spacer plate (called spacer). The surface of the liner must be flush within 0.020 in. (0.508 mm) of the platform of the strut. See table 402 (Ref. Fig. 405, 406). If necessary, replace the spacer that is now installed on the case, as follows.

NOTE : It is possible that the spacer is bonded to the fan exit case flange assembly (called V.groove rail) with adhesive transfer tape.
Refer to key of (Ref. Fig. 405, 406) for the necessary tolerance in areas AH.
You must use a Class 4 spacer with an acoustical liner.

Class	Spacer Thickness - In (mm)
1	0.022 - 0.028 (0.559 - 0.711)
2	0.036 - 0.044 (0.914 - 1.118)
3	0.058 - 0.068 (1.473 - 1.727)
4	0.075 - 0.085 (1.905 - 2.159)
5	0.095 - 0.105 (2.413 - 2.667)

Class	Spacer Thickness - In (mm)
6	0.120 - 0.130 (3.048 - 3.302)

Spacer Plate Thickness
Table 402

1 Remove the spacer from the case. If necessary, remove the adhesive transfer tape.
2 Prepare the spacer and V.groove rail for the installation of tape as follows :
- With a piece of Material No.P05-038 that is moist with Material No.P11-014, wipe the areas you will bond.
- Dry the surfaces fully in air that is at ambient temperature. When dry, there must be no alcohol on the parts.
3 Install Material No.P05-231 on either the V.groove rail or the spacer. Remove tape from the bolt holes.
4 Align the holes of the V.groove rail and the spacer. Install the spacer on the V.groove rail.

(d)Apply sealant to the space on the V.groove rail between the ends of the spacers.
1 Mechanically remove any sealant that is in the space.
2 Prepare the V.groove rail as follows :
- Clean the area where you will apply the sealant. Use a piece of Material No.P05-038 that is moist with Material No.P11-014.
- Dry the surface fully in air that is at ambient temperature. When dry there must be no alcohol on the parts.
3 Apply Material No.P09-014 or Material No.P09-027 to the area.
4 Apply Material No.P05-133 to the liner in the same area.

(e)Install the liner as follows.
1 If applicable, remove the temporary screws/bolts that attach the washers to the brackets.

CAUTION : BE VERY CAREFUL WHEN YOU REMOVE OR INSTALL A LINER SEGMENT. THE WASHERS THAT ARE ATTACHED TO THE FRONT LINER BRACKET CAN BECOME DISCONNECTED FROM THE BRACKET. ALSO, IF THE EDGE OF THE LINER SEGMENT HITS SOMETHING, IT CAN DELAMINATE.

2 Install two screws/bolts, threads lubricated with Material No.P03-001, to holes in the leading edge of the liner. Put the liner in position on the case. Handtight the screws/bolts. Engines with non-acoustical liners (Ref. Fig. 405). Engines with acoustical liners (Ref. Fig. 406).

NOTE : Screws are pre SB PW4ENG 72-107, bolts are post SB PW4ENG 72-107.
The 6 o'clock liner does not use bolts/screws at the leading edge.

3 Install screws/bolts, threads lubricated with Material No.P03-001, in the trailing and axial edges of the liner. Handtighten the screws/bolts.
4 TORQUE all the screws/bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN) in the sequence that follows :
- Front fasteners.

- Rear fasteners.
- Axial fasteners.

5 Visually examine each fastener to be sure that it touches the washer. If it does not touch the washer, remove it, apply new fabricant, and install it again.

NOTE : It is not necessary for the fastener to be symmetrically installed in the recess.

6 Permit the sealant at the trailing edge to cure in air that is at room temperature and has a relative humidity of 25 percent, for two hours, minimum, and until no longer tacky. Remove unwanted sealant from the flowpath.

(f)For engines with the acoustical fan exit liner segment assemblies (inner rear), use one of the methods that follow to fill the screws holes in the liners (Ref. Fig. 406).

NOTE : The liner at 6 o'clock is a non-acoustical liner.

1 First method:
- Clean the screw heads and holes with Material No.P11-014.
- Cover the screw heads only with Material No.P09-029.
- Fill the outer part of the holes and an area approximately 0.125 in. (3.175 mm) larger than the hole with Material No.P09-014.

2 Second method:
- Cover the screw heads with Tape Material No.P05-231, film side up.
- Clean the holes with Material No.P11-014.
- Fill the outer part of the holes and an area approximately 0.125 in. (3.175 mm) larger than the hole with Material No.P09-014.

3 Third method:
- Cover the screw heads with Material No.P05-137. Cure at 400°F (204.4°C) for one hour.
- Clean the holes with Material No.P11-014.
- Fill the outer part of the holes and an area approximately 0.125 in. (3.175 mm) larger than the hole with Material No.P09-014.

4 Fourth method:
- Fill the screw holes with AMS 7267 or AMS 7276 packing material.
- Clean the packing material and holes with Material No.P11-014.
- Fill the outer part of the holes and an area approximately 0.125 in. (3.175 mm) larger than the hole with Material No.P09-014.

(g)If you installed a liner at 11 o'clock or 1 o'clock, apply sealant to Area AL (Ref. Fig. 403).

1 Clean the areas the sealant will touch. Use a piece of Material No.P05-038 that is moist with Material No.P11-014.

2 Apply Material No.P18-007 to all cleaned surfaces.
- It is necessary to apply the primer in less than two hours after you cleaned the area.
- The primer must cure in air that is at ambient temperature for two hours, minimum. The air must have a relative humidity of 25 percent, minimum.

3 Apply Material No.P09-019
- It is necessary to apply the sealant from 2 - 24 hours after you applied the primer.
- Use a hot air gun at 175° - 225°F (79° - 107°C) for 5 - 7 minutes to dry the sealant.

- After the hot air gun, cure the sealant in air that has a relative humidity of 25 percent, minimum, for eight hours, minimum, before you touch the parts.

(5)Close-up
(a)Remove access platform.
(b)Close the thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(c)Remove safety clips and tags and close circuit breakers.

R D. Procedure to use with the replacement of a liner (Post SB PW4ENG 72-519).
(1)Equipment and materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C. Material No.P03-001	Oils (Ref. 70-00-00)
D. Material No.P05-038	Special Materials (Ref. 70-00-00)
E. Material No.P05-099	Special Materials (Ref. 70-00-00)
F. Material No.P05-133	Special Materials (Ref. 70-00-00)
G. Material No.P05-231	Special Materials (Ref. 70-00-00)
H. Material No.P09-014	Sealants (Ref. 70-00-00)
I. Material No.P09-027	Sealants (Ref. 70-00-00)
J. Material No.P11-014	Cleaning Agents (Ref. 70-00-00)
K. Material No.P18-007	Primer (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-13-00, P. Block 301	Cowl Doors

(2)Job Set-Up
(a)Open, safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(b)Install access platform.
(3)Removal (Ref. Fig. 404)
NOTE : Use this procedure to replace a liner. Use the procedure in paragraph 1. A., if you will install the same liner you removed.
(a)If applicable, cut the sealant at the axial edge of the liner.
CAUTION : BE VERY CAREFUL WHEN YOU REMOVE OR INSTALL A LINER SEGMENT. THE WASHERS THAT ARE ATTACHED TO THE FRONT LINER BRACKET CAN BECOME DISCONNECTED FROM THE BRACKET. ALSO, IF THE EDGE OF THE LINER SEGMENT HITS SOMETHING, IT CAN DELAMINATE.
(b)Remove the liner as follows.
NOTE : It is possible that classified washers are installed between the liner and the attachment bracket at the front center of the liner. Washers are attached to the bracket with sealant. It is possible that during engine operation, the washers can become disconnected from the bracket. This is also possible when you remove and install the screws that attach the liner to the bracket.
2 It is necessary to first remove the sealant that covers the screws and then remove the screws. Use mechanical means to remove the

sealant. Be careful not to damage the engine parts.

3 If applicable, mechanically remove the sealant from the axial edge of the liner and its mating parts.

(4)Installation

NOTE : Use this procedure to install a new liner, washers, or spacers, etc. Use the procedure in paragraph 1. A. to install the same liner you removed.

(a)(Reference 1005) Find the washer thickness necessary to make a 0.005 - 0.020 in. (0.127 - 0.508 mm) thick empty space between the washers and liner as follows (Ref. Fig. 407).

1 Attach 0.020 in. (0.508 mm) shim stock to the OD of the bracket with Material No.P05-099.

CAUTION : BE VERY CAREFUL WHEN YOU REMOVE OR INSTALL A LINER SEGMENT. IF THE EDGE OF THE LINER SEGMENT HITS SOMETHING, IT CAN DELAMINATE.

2 Temporarily attach the liner to the case with screws.

3 With a depth micrometer in the two forward holes, measure the depth from the top surface of the liner to the surface of the shim stock (Dimension A).

4 Remove the liner and shim stock.

5 Measure the thickness of the liner (Dimension B).

6 Subtract Dimension B from Dimension A to know the necessary thickness of the washers.

7 Use table 401 to choose the correct washer classification. Zero to three washers are necessary.

Class	Washer Thickness - In (mm)
1	0.009 - 0.011 (0.229 - 0.279)
2	0.019 - 0.021 (0.483 - 0.503)
3	0.029 - 0.031 (0.737 - 0.787)
4	0.039 - 0.041 (0.991 - 1.041)
5	0.049 - 0.051 (1.244 - 1.295)
6	0.099 - 0.101 (2.514 - 2.565)

Washer Thickness
Table 401

(b)Attach the washers to the bracket, as follows :

1 With a piece of Material No.P05-038 that is moist with a SPOP 208 solvent (Ref. 70-00-00, P. Block 201), wipe the areas you will bond.

2 Dry the areas fully in air that is at ambient temperature. When dry, there must be no solvent on the parts.

3 Apply Material No.P09-014 to the edges of the washers. Do not apply sealant to the mating surfaces of the washer and bracket. Use screws to temporarily hold the washers in position.

(c)Prepare the V.groove rail as follows.

1 Clean the area where you will apply the sealant. Use a piece of Material No.P05-038 that is moist with Material No.P11-014.

2 Dry the surface fully in air that is at ambient temperature. When dry there must be no alcohol on the parts.

3 Apply Material No.P09-014 or Material No.P09-027 to the area.

4 Apply Material No.P05-133 to the liner in the same area.

(e)Install the liner as follows.

1 If applicable, remove the temporary screws that attach the washers to the brackets.

CAUTION : BE VERY CAREFUL WHEN YOU REMOVE OR INSTALL A LINER SEGMENT. THE WASHERS THAT ARE ATTACHED TO THE FRONT LINER BRACKET CAN BECOME DISCONNECTED FROM THE BRACKET. ALSO, IF THE EDGE OF THE LINER SEGMENT HITS SOMETHING, IT CAN DELAMINATE.

2 Install two screws, threads lubricated with Material No.P03-001, to holes in the leading edge of the liner. Put the liner in position on the case. Tighten the screws with your hand. (Ref. Fig. 406)

NOTE : The 6 o'clock liner does not use screws at the leading edge.

3 Install screws, threads lubricated with Material No.P03-001, in the trailing and axial edges of the liner. Handtighten the screws.

4 TORQUE all the screws to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN) in the sequence that follows :
- Front fasteners.
- Rear fasteners.
- Axial fasteners.

5 Visually examine each fastener to be sure that it touches the washer. If it does not touch the washer, remove it, apply new lubricant, and install it again.

NOTE : It is not necessary for the fastener to be symmetrically installed in the recess.

6 Permit the sealant at the trailing edge to cure in air that is at room temperature and has a relative humidity of 25 percent, for two hours, minimum, and until no longer tacky. Remove unwanted sealant from the flowpath.

(f)Fill the screw holes with the method that follows. (Ref. Fig. 406)

NOTE : The liner at 6 o'clock is a non-acoustical liner.

1 Cover the screw heads with Tape Material No.P05-231, film side up.

2 Clean the holes with Material No.P11-014.

3 Fill the outer part of the holes and an area approximately 0.125 in. (3.175 mm) larger than the hole with Material No.P09-014.

(g)After you install a liner at 11 o'clock or 1 o'clock, apply sealant to Area AL (Ref. Fig. 403).

1 Clean the areas the sealant will touch. Use a piece of Material No.P05-038 that is moist with Material No.P11-014.

2 Apply Material No.P18-007 to all cleaned surfaces.
- It is necessary to apply the primer in less than two hours after you cleaned the area.
- The primer must cure in air that is at ambient temperature for two hours, minimum. The air must have a relative humidity of 25 percent, minimum.

3 Apply Material No.P09-014
- It is necessary to apply the sealant from 2 - 24 hours after you applied the primer.
- Use a hot air gun at 175° - 225°F (79° - 107°C) for 5 - 7 minutes to dry the sealant.
- After the hot air gun, cure the sealant in air that has a relative

humidity of 25 percent, minimum, for eight hours, minimum, before you touch the parts.

(5)Close-up
(a)Remove access platform.
(b)Close the thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(c)Remove safety clips and tags and close circuit breakers.

2. Fan Exit Liner Segments (Inner Front)

A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C. Material No.P03-001	Oils (Ref. 70-00-00)
D. Material No.P05-038	Special Materials (Ref. 70-00-00)
E. Material No.P09-014	Sealants (Ref. 70-00-00)
F. Material No.P09-027	Sealants (Ref. 70-00-00)
G. Material No.P11-014	Cleaning Agents (Ref. 70-00-00)
H.	Torque Wrench
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

C. Removal (Ref. Fig. 408)
CAUTION : BE VERY CAREFUL WHEN YOU REMOVE A LINER SEGMENT. IT IS POSSIBLE THAT THERE ARE WASHERS ATTACHED TO THE LINER. IT IS EASY FOR THESE WASHERS TO BECOME DISCONNECTED FROM THE LINER.
(1)Remove the liner segment.
(a)If necessary, cut the sealant around the liner segment with a knife.
(b)Remove the screws that attach the liner segment to the fan case.
(c)Remove the liner segment.
(2)With a tool, remove the old sealant from the surfaces that the new sealant will touch.

D. Installation (Ref. Fig. 408)

ITEM	FAN EXIT LINER SEGMENTS
1	PN 50G664 or 51G768-01
2	PN 50G666 or 51G769-01
3	PN 50G667 or 51G770-01
4	PN 50G668 or 51G771-01
5	PN 50G669 or 51G772-01
6	Apply sealant here, 14 locations.
7	Apply sealant here. The sealant

ITEM	FAN EXIT LINER SEGMENTS
	must be continuous with to 0.010 in. (0.254 mm) above, surface R, 8 locations at Z.

Table 403

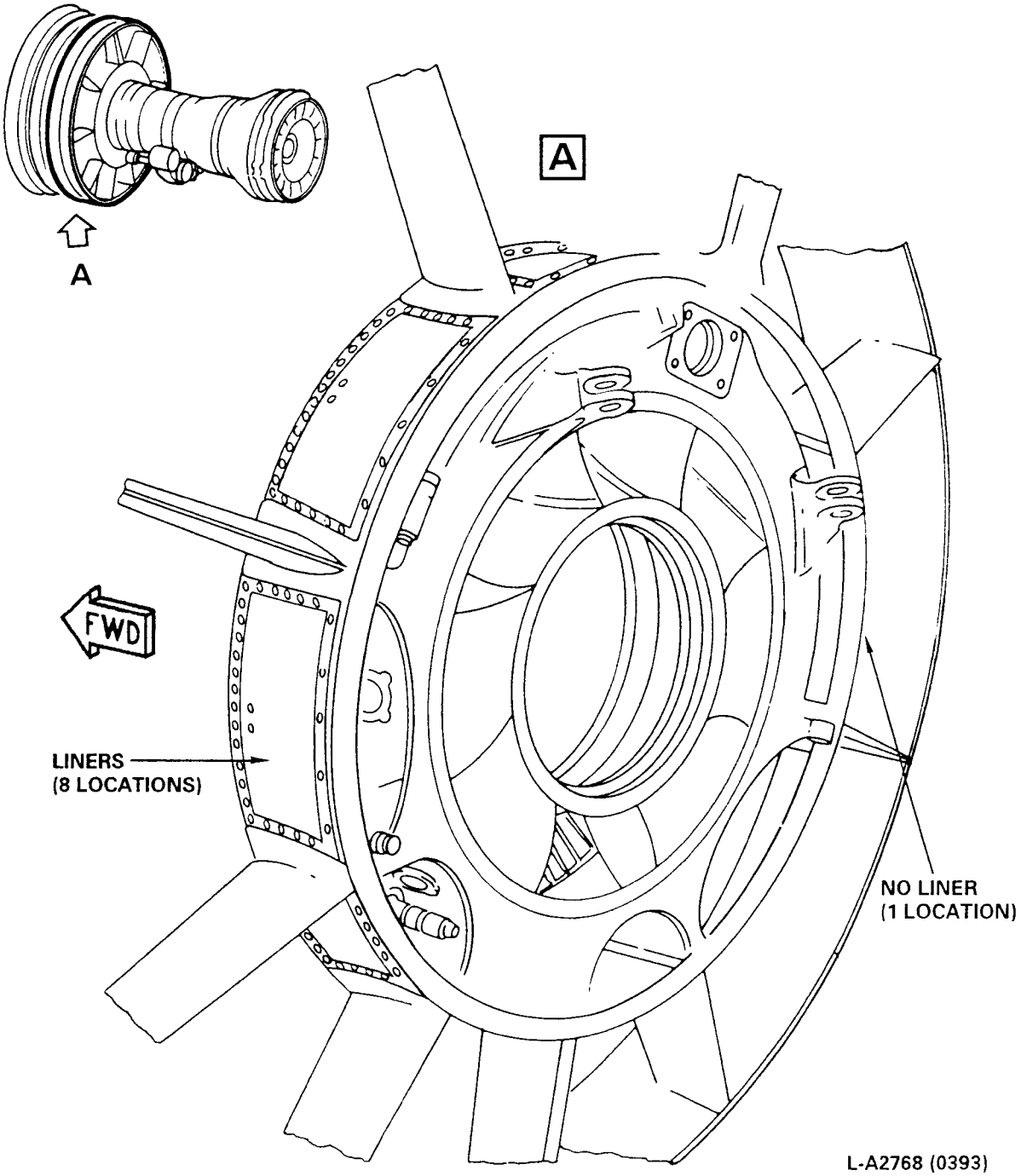
CAUTION : BE VERY CAREFUL WHEN YOU REMOVE A LINER SEGMENT. IT IS POSSIBLE THAT THERE ARE WASHERS ATTACHED TO THE LINER. IT IS EASY FOR THESE WASHERS TO BECOME DISCONNECTED FROM THE LINER.

(1)Attach a liner segment to the fan case.
  (a)Apply Material No.P03-001 to the threads of the screws.
  (b)Attach a liner segment to the fan case with the screws. Tighten the screws against the liner.
(2)(References 751 and 1012) Do a check of the clearance between the trailing edge of the fan exit liner segment (inner front) and the front of the fan exit liner segment (inner rear).
  NOTE : This check is not necessary if the (inner front) liner is in front of an acoustical (inner rear) liner (Ref. Fig. 409).
(3)Where the clearance is not correct, attach washers to the boltholes at the trailing edges of the (front) liners as follows : see table 404 for washer thicknesses.
  NOTE : If the (inner rear) liner is an acoustical liner, you must use a class 6 washer at the (inner front) liner.

CLASS	WASHER THICKNESS In. (mm)
1	0.009 - 0.011 (0.229 - 0.279)
2	0.019 - 0.021 (0.483 - 0.503)
3	0.029 - 0.031 (0.737 - 0.787)
4	0.039 - 0.041 (0.991 - 1.041)
5	0.049 - 0.051 (1.244 - 1.295)
6	0.099 - 0.101 (2.514 - 2.565)

Washer Thickness
Table 404

  (a)Remove the screws from the trailing edges of the (front) liners and/or fairing at flange D.
  (b)Clean the washers and the area around the boltholes. Use a clean piece of cheesecloth Material No.P05-038 that is moist with Material No.P11-014. Dry the surfaces fully in air that is at room temperature. There must be no alcohol on the parts when sealant is applied.
  (c)Put the washers in the correct position on the liner. Install screws if necessary.
  (d)Bond the washers to the (front) liners with a fillet of Material No.P09-014 or P09-027 all around. Cure the sealant in air that is at room temperature for two hours, minimum, and until no longer tacky, before you touch it.
    NOTE : It is permitted to have a very small quantity of sealant between the washer and the liner.



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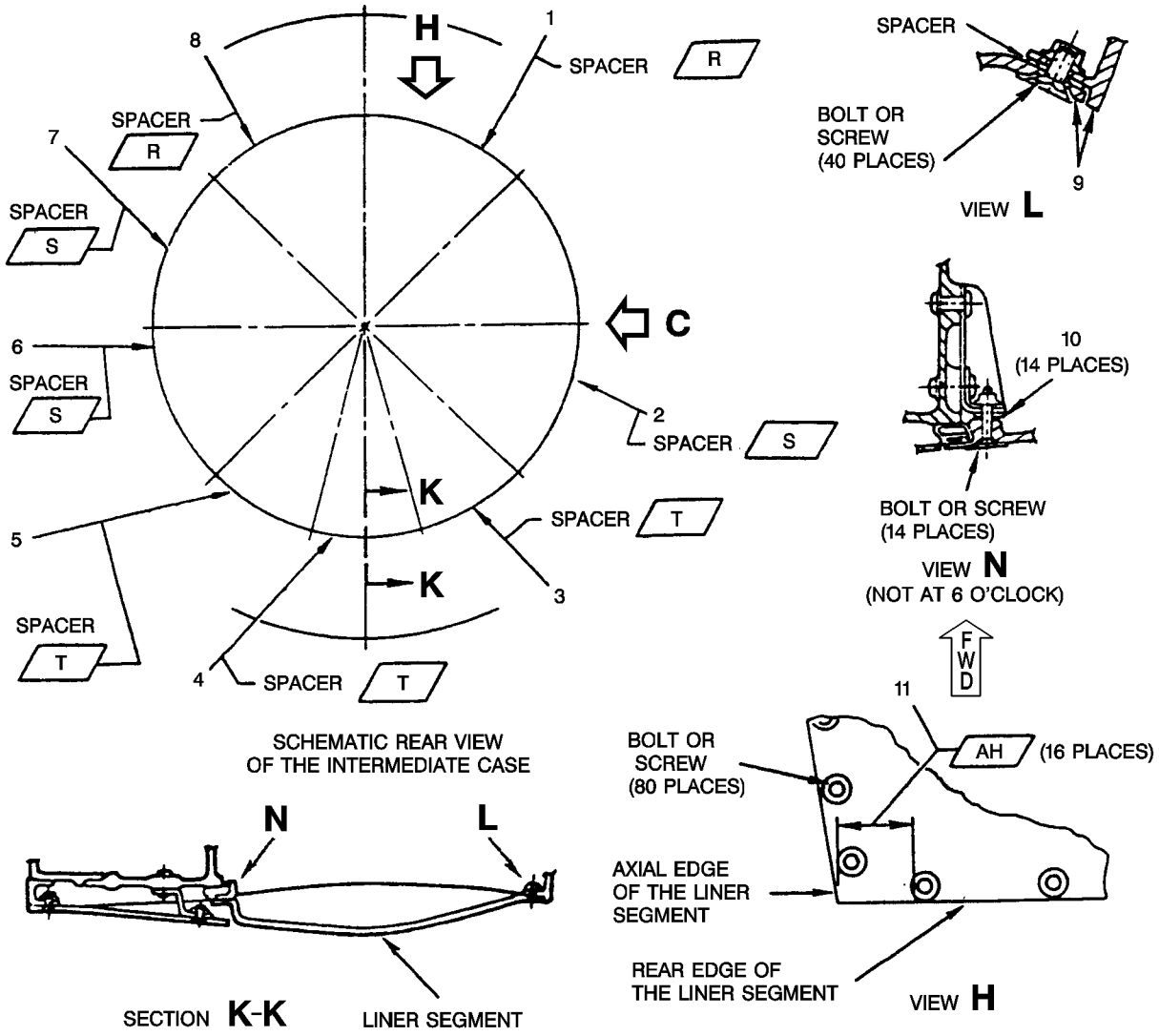
Fan Exit Liner Locations
Figure 404



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1. SEE PPIPC FOR LINER ASSEMBLY PN
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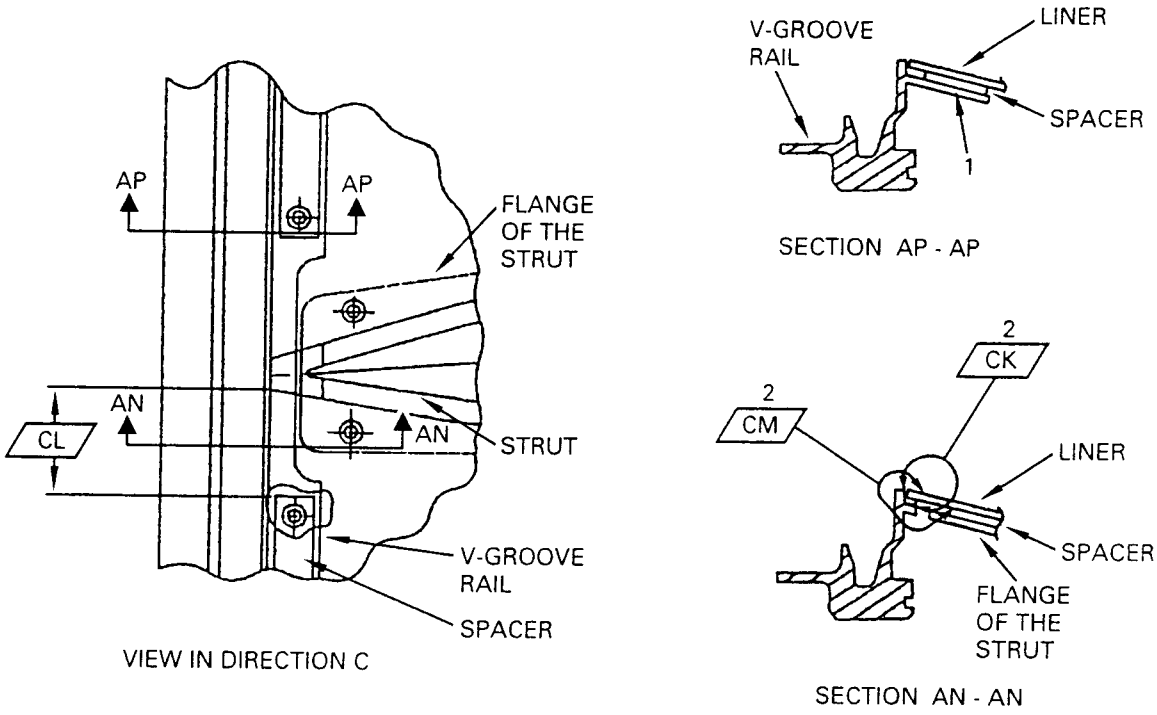
5. SEE PPIPC FOR LINER ASSEMBLY PN
6. SEE PPIPC FOR LINER ASSEMBLY PN
7. SEE PPIPC FOR LINER ASSEMBLY PN
8. SEE PPIPC FOR LINER ASSEMBLY PN
9. EXCEPT IN AREAS AH, THESE SURFACES MUST BE EVEN WITHIN 0.020 in. (0.508 mm). CHOOSE THE CLASS OF SPACER NECESSARY TO HAVE THIS. IN AREAS AH, THESE SURFACES MUST BE EVEN WITHIN 0.040 in. (1.016 mm), MAXIMUM.
10. 0-3 WASHERS, AS NECESSARY.
11. 2.000 in. (50.800 mm) MAXIMUM, OR TO THE NEAREST SCREW, POSITIONS AH

BM5 72 23 05 4 KAPA 02

Installation of the Fan Exit Liner Segment Assembly
(Non-Acoustical Liners) (Sheet 1/2)
Figure 405

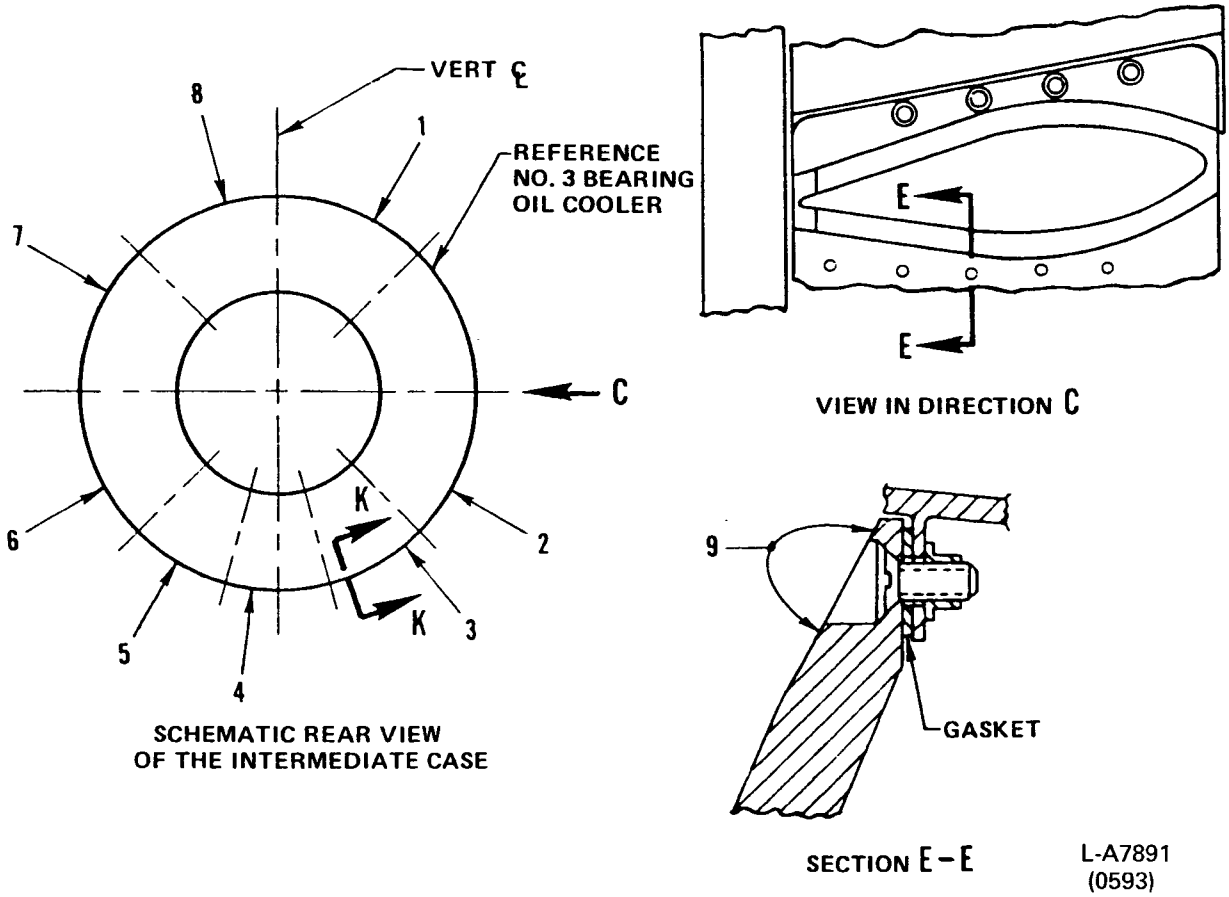


L-A8697 (0000)

1. Bond the spacers.
2. Apply sealant in Area CK for distance CL.
   Apply Mold Release to the liner.

BM5 72 23 05 4 KAPC - 00

Installation of the Fan Exit Liner Segment Assembly
(Non-Acoustical Liners) (Sheet 2/2)
Figure 405



1. SEE PPIPC FOR LINER ASSEMBLY PN
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3. SEE PPIPC FOR LINER ASSEMBLY PN
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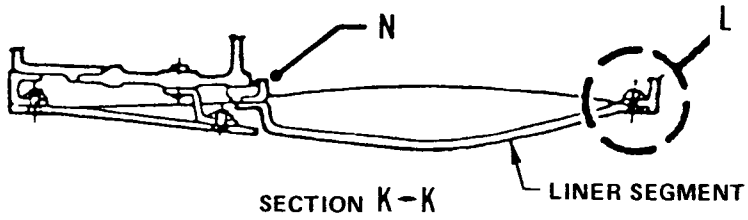
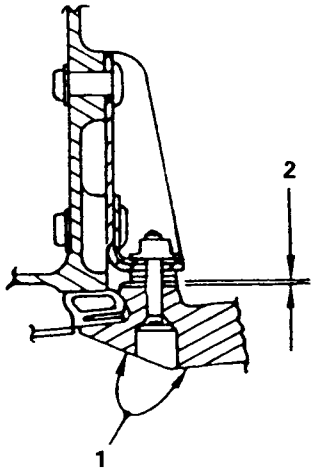
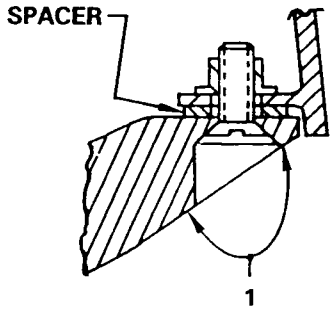
5. SEE PPIPC FOR LINER ASSEMBLY PN
6. SEE PPIPC FOR LINER ASSEMBLY PN
7. SEE PPIPC FOR LINER ASSEMBLY PN
8. SEE PPIPC FOR LINER ASSEMBLY PN
9. THE AREA OF SEALANT

BM5 72 23 05 4 KATA 03

Installation of the Fan Exit Liner Segment Assembly
(Acoustical Liners) (Sheet 1/2)
Figure 406





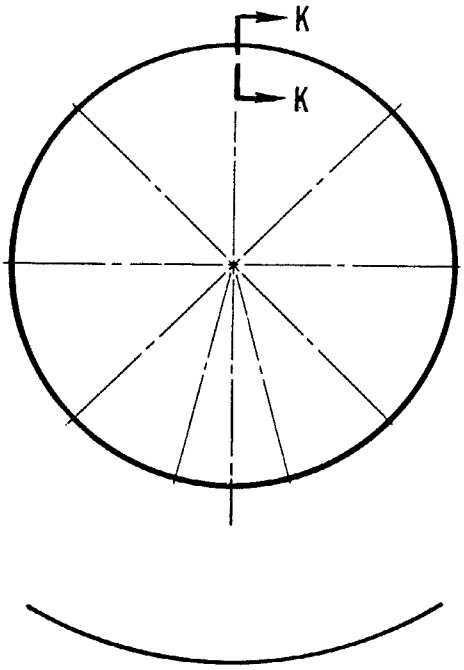


L-A7892
(0593)

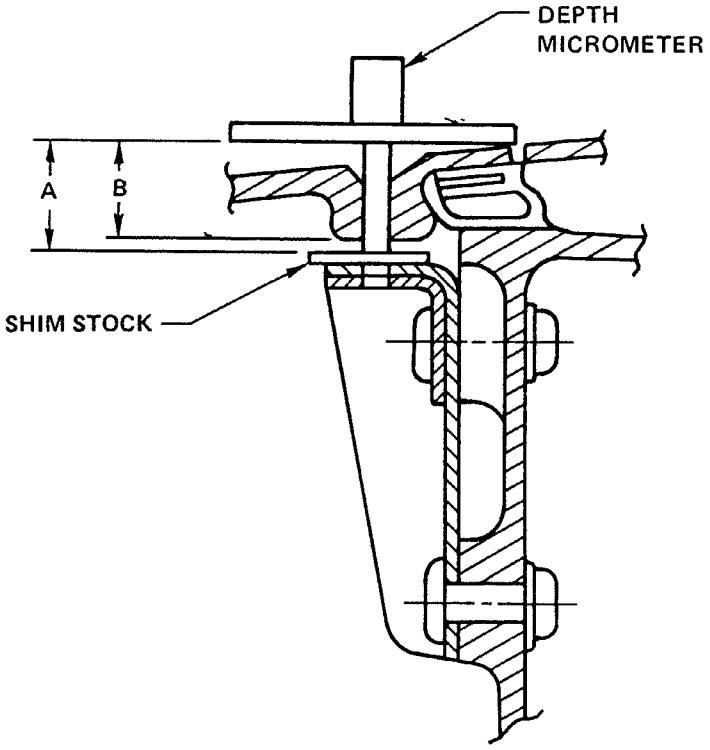
1. The Area Of Sealant.
2. 0.005 - 0.020 Inch (0.13 - 0.51 mm). Choose The Correct Class Of Washer Before You Install The Screws.

BM5 72 23 05 4 KATC 00

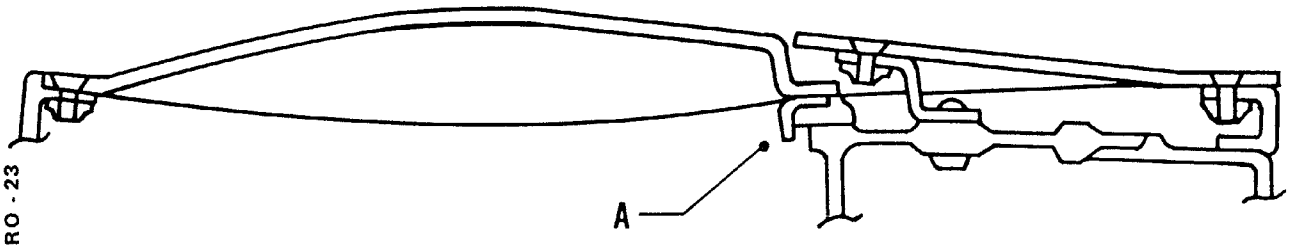
Installation of the Fan Exit Liner Segment Assembly
(Acoustical Liners) (Sheet 2/2)
Figure 406



SCHEMATIC REAR VIEW OF
INTERMEDIATE CASE



VIEW A



SECTION K-K

BM5 72 23 05 4 KARO - 23

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Washer Thickness Measurement
Figure 407

(e)Attach the trailing edges of the liners with screws, threads lubricated with Material No.P03-001. Refer to table 405 for screw lengths. TORQUE all the screws to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).

Screw PN	Screw Length	Washer Thickness	Quantity of Screws
593111	0.495 - 0.505	0.000 - 0.015	0-43 as necessary
ST1382-09	0.542 - 0.562	0.016 - 0.070	0-43 as necessary
ST1382-10	0.594 - 0.625	0.071 - 0.130	0-43 as necessary
ST1382-11	0.656 - 0.687	0.131 - 0.210	0-43 as necessary

Washer Thickness and Screw Lengths
Table 405

(4)Clean the areas where there will be sealant.
(a)Make a clean piece of cheesecloth moist with Material No.P11-014.
(b)With the cheesecloth, rub the areas the sealant will touch.
(c)Dry the cleaned areas in air until there is no alcohol on the parts.
(5)Apply sealant to the edges of the liner.
(a)Apply Material No.P09-014 or No.P09-027 to the edges of the liner segment.
(b)Cure the sealant in air that is at 25 percent relative humidity, minimum. Cure it for two hours minimum, and until no longer tacky before you touch it.
If possible, cure the sealant for eight hours, total, before operation of the engine.

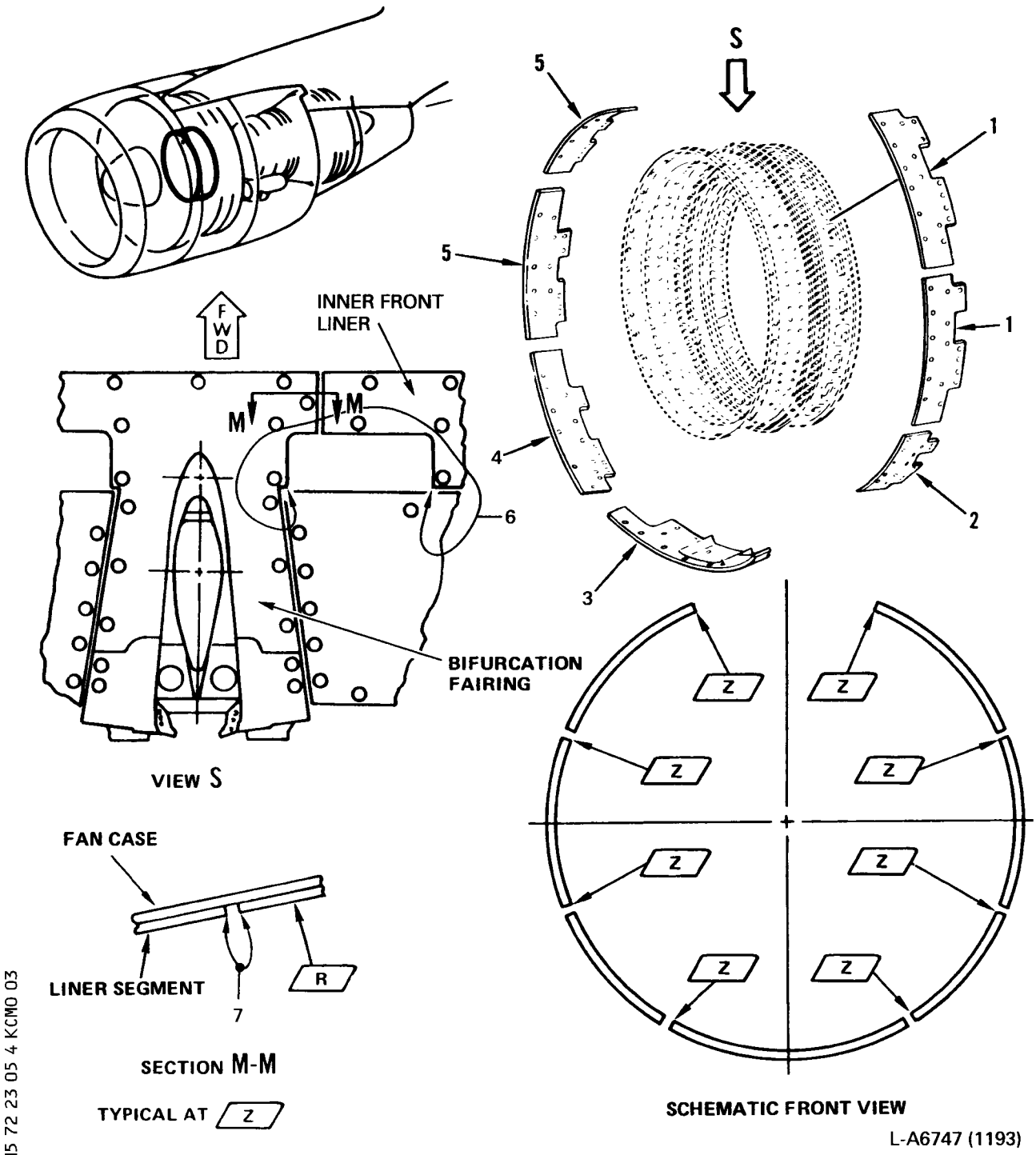
E. Close-Up
(1)Remove access platform.
(2)Close the thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(3)Remove safety clips and tags and close circuit breakers.

3. Fan Exit Liner Segments (Outer)

A. Equipment and Materials

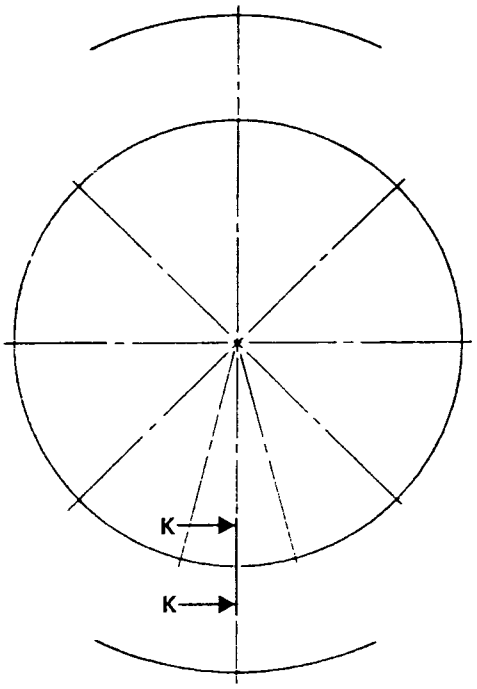
ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C. Material No.P03-001	Oils (Ref. 70-00-00)
D. Material No.P05-038	Special Materials (Ref. 70-00-00)
E. Material No.P05-155	Special Materials (Ref. 70-00-00)
F. Material No.P05-203	Special Materials (Ref. 70-00-00)
G. Material No.P09-014	Sealants (Ref. 70-00-00)
H. Material No.P09-027	Sealants (Ref. 70-00-00)
I.	Torque Wrench
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up

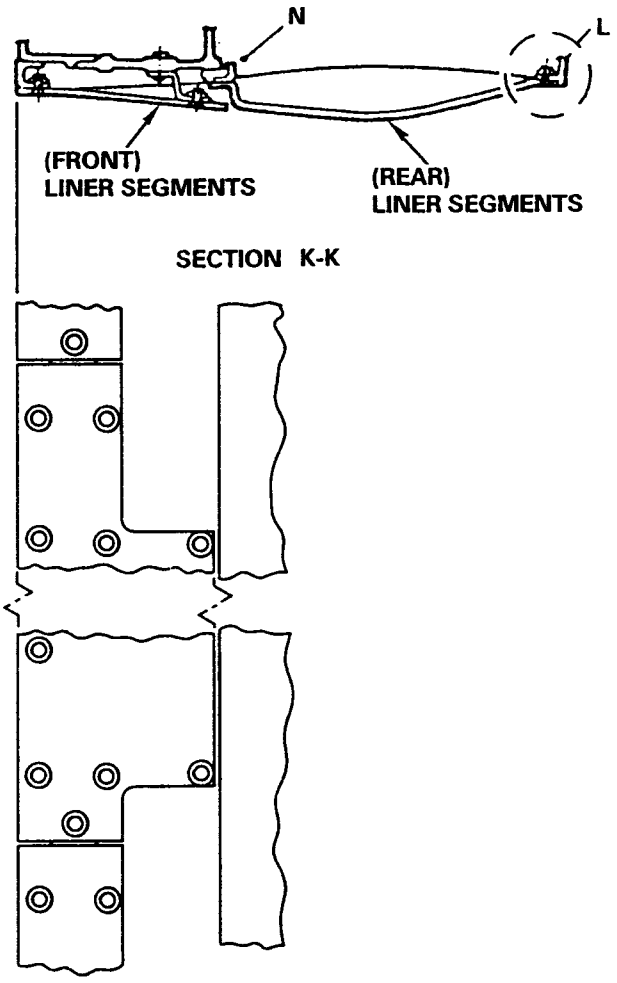


BM5 72 23 05 4 KCMO 03

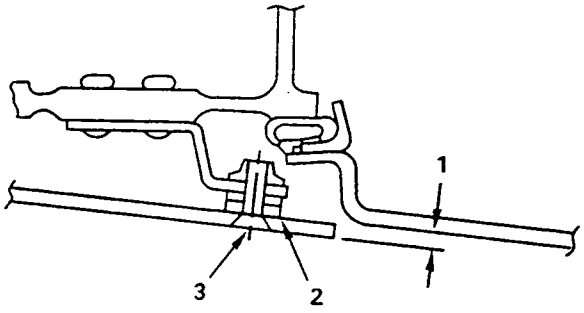
Fan Exit Liner Segments (Inner Front)
Figure 408



SCHEMATIC REAR VIEW
OF THE INTERMEDIATE CASE



SECTION K-K



VIEW N
(USUAL FOR 7 LINERS)

1. 0.000 - 0.040IN. (0.00 - 1.02MM) CLEARANCE NECESSARY
2. WASHERS, 43 PLACES POSSIBLE. CHOOSE THE CORRECT CLASS AND QUANTITY (0 - 4)
3. TRAILING EDGE SCREWS, 43 PLACES. CHOOSE THE CORRECT SCREW.

BM5 72 23 05 4 KEMO 00

L - A9006(0000)

Inspection of the Clearance Between the (Front)
and (Rear) Liners
Figure 409

(1)Open, safety and tag the appropriate circuit breakers and open the fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

C. Removal
(1)Remove the liner.
(a)Remove the screws that attach the liner to the intermediate case. Use a No. 10 Torq-Set Drive.
(b)Cut the sealant at the edges of the liner.
CAUTION : DO NOT USE A TOOL TO LIFT THE LINER FROM THE CASE IF YOU WILL REPAIR THE LINER. TO USE A TOOL CAN CAUSE THE LINER TO DELAMINATE.
(c)Remove the liner.
(d)If you use this liner again, remove all sealant from the liner with a putty knife. Do not damage the liner when you do this.
(2)Mechanically remove any old sealant from the brackets that the liner attaches to and from the mating surfaces of the intermediate case.

D. Installation
(1)Installation of the liners (Intermediate cases that are pre SB PW4 ENG 72-205) (Ref. Fig. 410)
(a)See to Fig. (Ref. Fig. 410) (Sheet 1).

ITEM	Intermediate Cases
1	315° 46'
2	270° 23'
3	225°
4	195°
5	165°
6	135°
7	89° 37'
8	0.030 - 0.090 in. (0.76 - 2.29 mm) Eight places
9	44° 37'
10	PN 50G824 or 51G907-01
11	PN 50G822 or 51G905-01
12	PN 50G821 or 51G904-01
13	PN 50G823 or 51G906-01
14	PN 50G820 or 51G903-01
15	PN 50G819 or 51G902-01
16	PN 50G825 or 51G908-01
17	Apply sealant here. The sealant must be even with, to 0.010 in. (0.254 mm) above, surfaces M and N for distance DV.
18	It is permitted for this surface to be irregular. No control is necessary.
19	Apply sealant here. The sealant must be even with, to 0.020 in. (0.508 mm) above, surfaces R, 16 places.
20	No sealant is permitted in this area, 8 places.

Table 406

(b)See to Fig. (Ref. Fig. 410) (Sheet 2).

ITEM	Intermediate Cases
1	PN ST1382-07
2	0.060 in. (1.524 mm) maximum
3	0.125 in. (3.175 mm) minimum
4	The sealant all around must be even with, to 0.010 in. (0.254 mm) above, the adjacent surfaces.

Table 407

(c)See to Fig. (Ref. Fig. 410) (Sheet 3)

ITEM	Intermediate Cases
1	It is permitted for this surface to be irregular.
2	Fill all around with sealant
3	0.250 - 0.500 in. (6.4 - 12.7 mm) modified radius. Fill all around with sealant.
4	Apply sealant for the full length of the space between the liners. The sealant must be even with, to 0.020 in. (0.508 mm) above, surface S.

Table 408

(2)Installation of the liners (Intermediate cases that are post SB PW4 ENG 72-205) (Ref. Fig. 411).

(a)See to Fig. (Ref. Fig. 411) (Sheet 1).

ITEM	Intermediate Cases
1	PN 51G907-01
2	PN 51G905-01
3	PN 51G904-01
4	PN 51G906-01
5	PN 51G903-01
6	PN 51G902-01
7	PN 51G908-01
8	Apply sealant. The sealant must be even with, to 0.020 in. (0.508 mm) above, the adjacent surfaces, 16 places.
9	Apply sealant. The sealant over distance C must be even with, to 0.010 in. (0.254 mm) above the adjacent surfaces.

ITEM	Intermediate Cases
10	This surface can be irregular. No control is necessary.
11	No sealant is permitted in this area, eight places.

Table 409

(b)See to Fig. (Ref. Fig. 411) (Sheet 2).

ITEM	Intermediate Cases
1	PN 593111
2	Apply sealant all around. The sealant must be even with, to 0.010 in. (0.254 mm) above, the adjacent surfaces.
3	0.125 in. (3.175 mm) minimum
4	0.060 in. (1.524 mm) maximum
5	Fill with sealant, all around.
6	0.250 - 0.500 in. (6.4 - 12.7 mm) modified radius, all around, unless otherwise specified.
7	This surface can be irregular. No control is necessary.
8	Apply sealant for the full length of the space between the liner and the strut. The sealant must be even with, to 0.020 in. (0.508 mm) above, the adjacent surfaces.

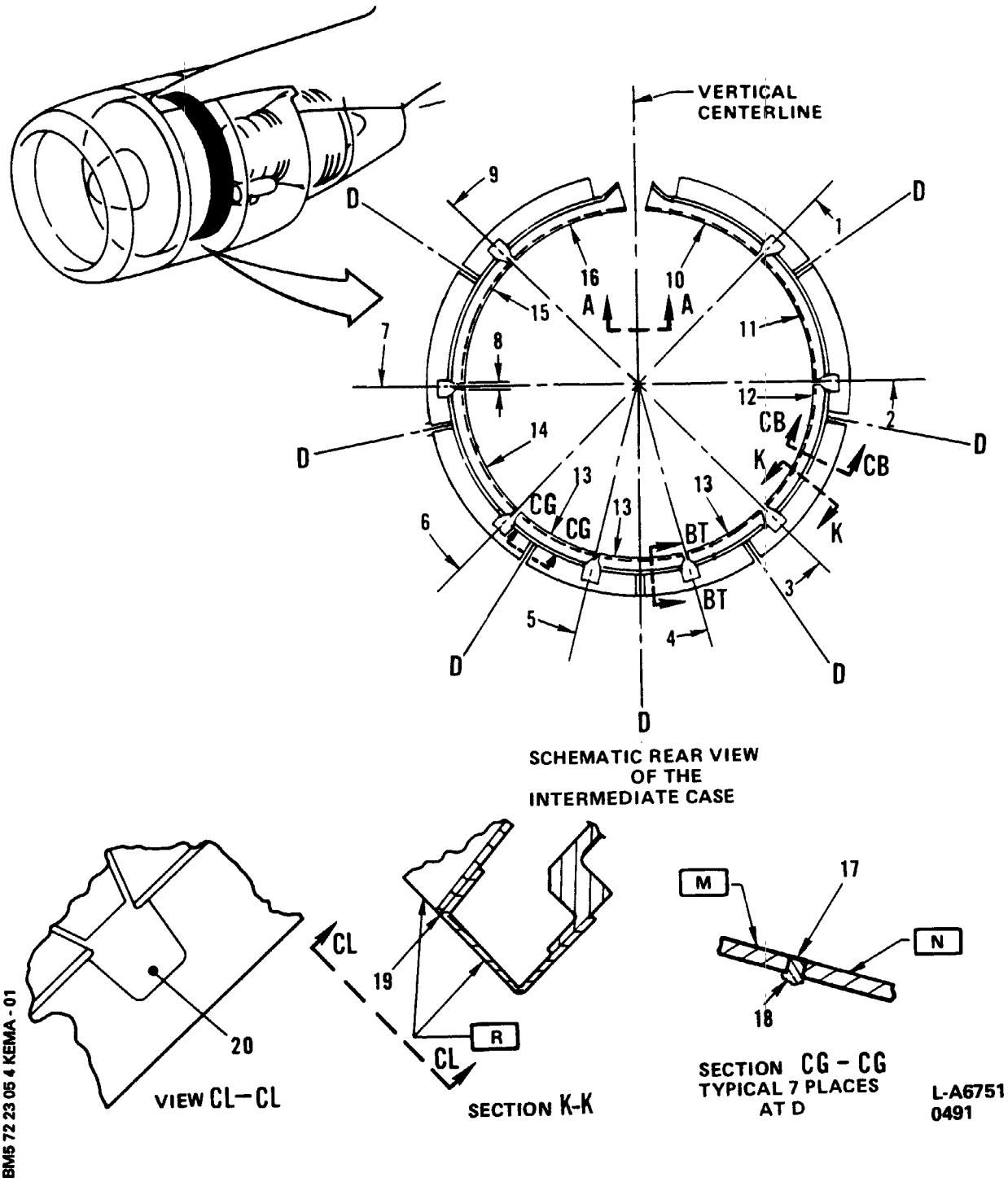
Table 410

(3)Attach the liner to the intermediate case.
  (a)Apply Material No.P03-001 to the threads of the screws.
  (b)Attach the liner with the screws.
  (c)Torque the screws to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).
(4)Clean the parts of the bracket, liner, and intermediate case that the sealant will touch.
  (a)Make a piece of new cheesecloth Material No.P05-038 wet with a SPOP 208 solvent (Ref. 70-00-00, P. Block 201).

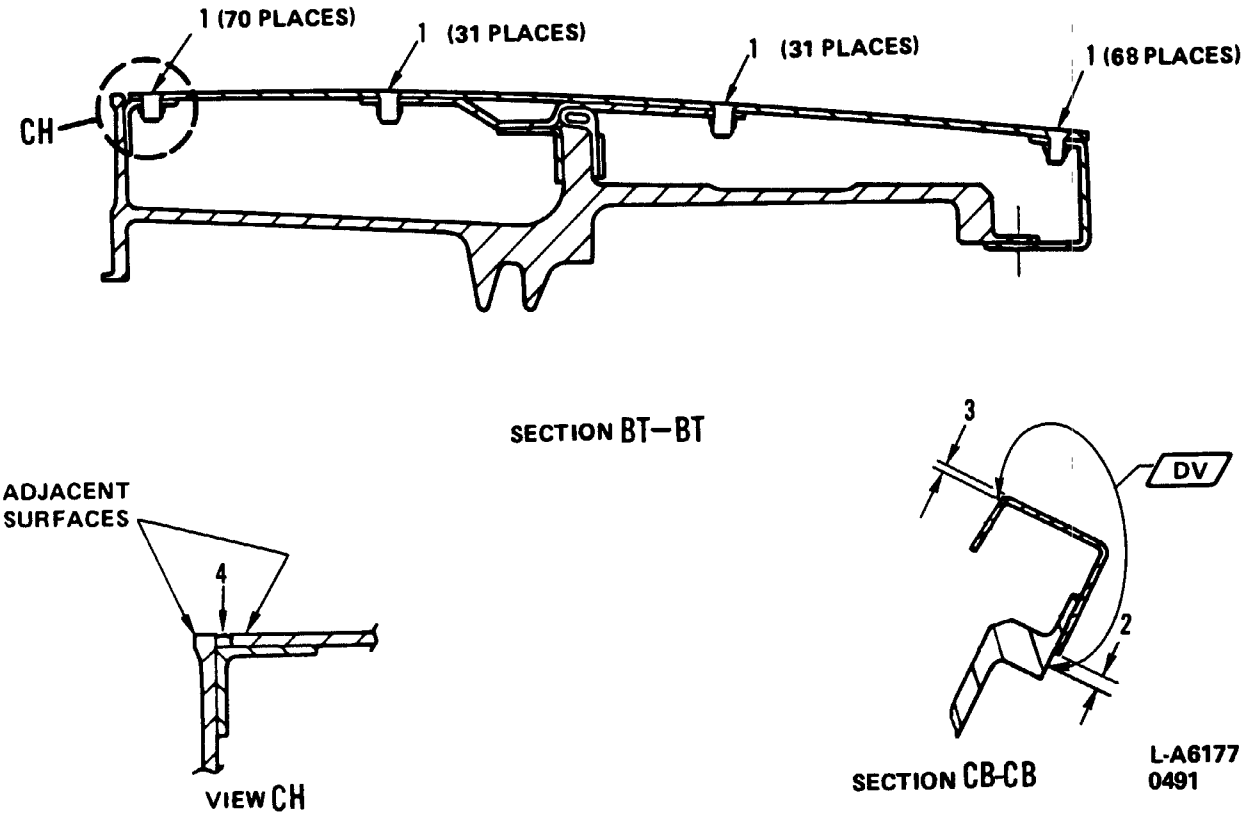
  (b)With the cheesecloth, rub the areas the cheesecloth will touch.
  (c)Permit the cleaned areas to dry fully. There must be no solvent on the parts.
  (d)If you do not apply the sealant immediately, cover the cleaned parts with Material No.P05-155 or No.P05-203.
  (e)You must apply sealant in two hours.
(5)Apply Material No.P09-014 or No.P09-027 where shown in the referenced figure.
  (a)Remove unwanted sealant with Material No.P05-038.
  (b)Cure the sealant :

R 1 Thickness of the sealant must be equal to or less than
R 0.250 in. (6.350 mm).
R 2 After sealant is applied, no physical contact with baffles,
R bracket assemblies or the liner is permitted for the first two
R hours minimum of a 6 hour minimum total cure time.
R 3 The relative humidity of the work area must be equal to or
R greater than 50%. A local humidity environment is allowed if
R required. Do not apply heat with heat gun or humidity with water
R spray on the sealant.
R 4 The temperature of the work area must be equal to or greater
R than 73.4 °F (23.0 °C). A local temperature environment is
R allowed if required. Do not apply heat with heat gun or humidity
R with water spray on the sealant.

E. Close-Up
(1)Remove access platform.
(2)Close the thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(3)Remove safety clips and tags and close circuit breakers.

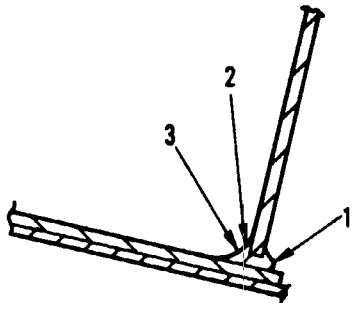


Installation of the Liners (Intermediate Cases that are Pre SB PW4 ENG 72-205) (Sheet 1/4)
Figure 410

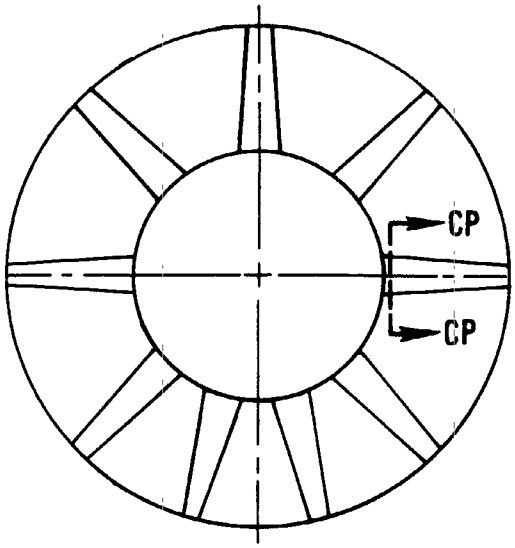


BM5 72 23 05 4 KEMC - 01

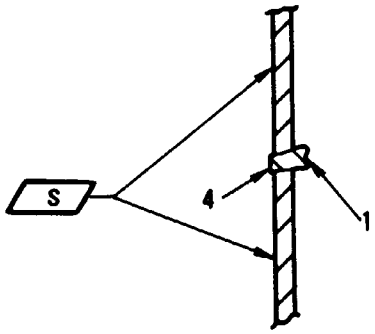
Installation of the Liners (Intermediate Cases that are Pre SB PW4 ENG 72-205) (Sheet 2/4)
Figure 410



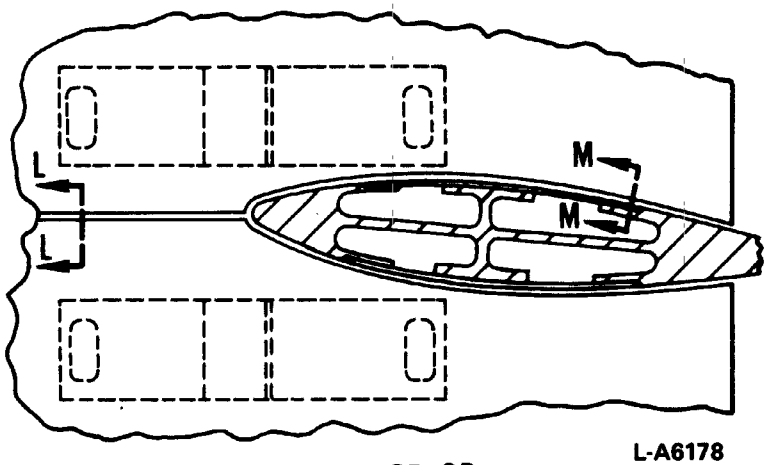
SECTION M-M
TYPICAL 8 PLACES



SCHEMATIC REAR VIEW OF
THE INTERMEDIATE CASE



SECTION L-L
TYPICAL 8 PLACES



SECTION CP-CP

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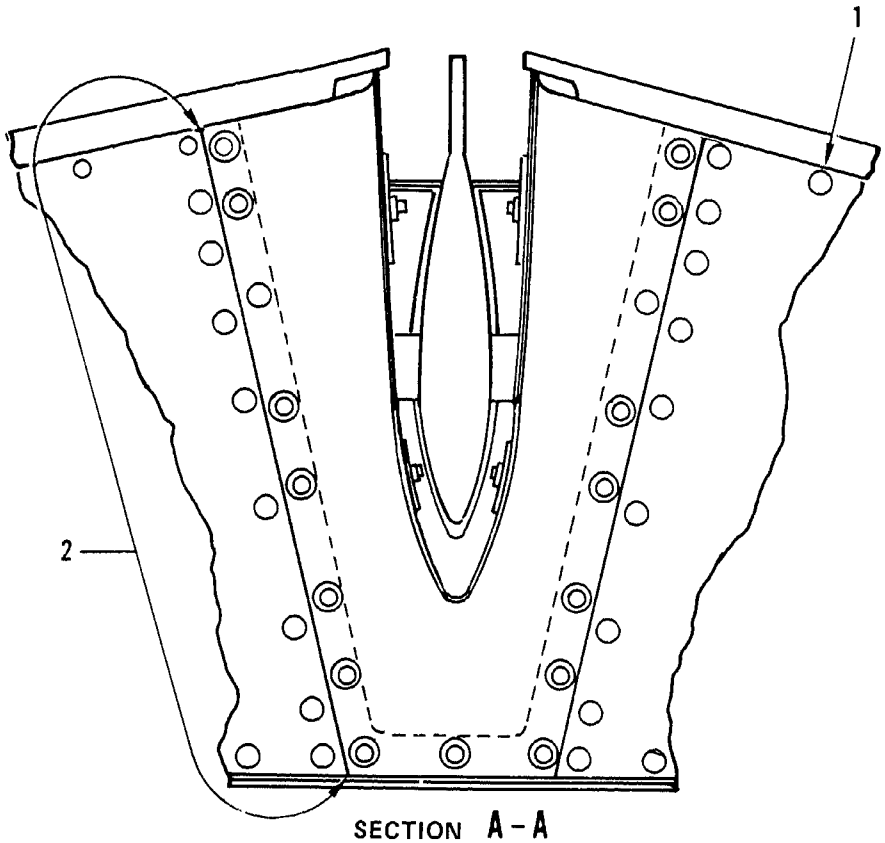
BM5 72 23 05 4 KEME - 01

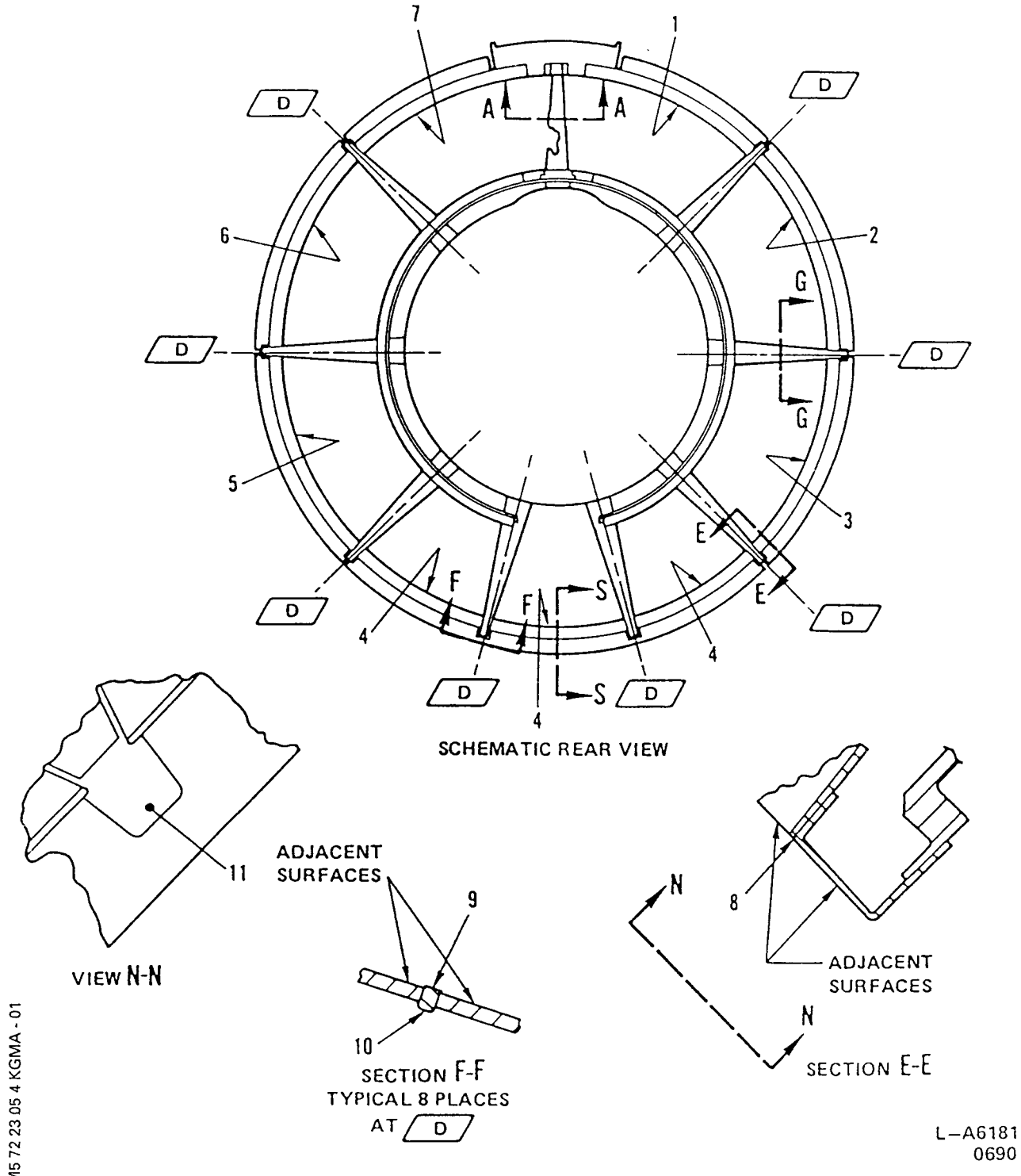
Installation of the Liners (Intermediate Cases
that are Pre SB PW4 ENG 72-205) (Sheet 3/4)
Figure 410



1. 18 PLACES, SEE PPIPC FOR LINER SEGMENT PN.
2. APPLY SEALANT TO THE CLEARANCE BETWEEN THE LINER AND THE FAIRING, TWO PLACES.

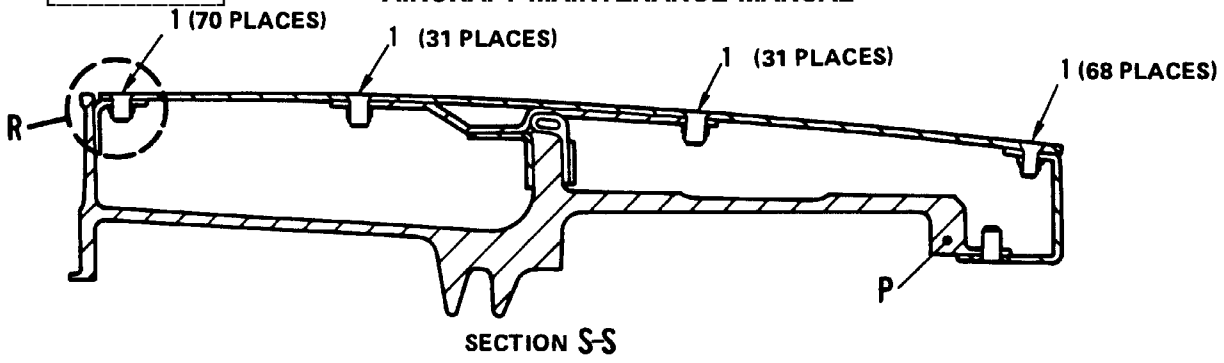
BM5 72 23 05 4 KEMG 01

Installation of the Liners (Intermediate Cases that are Pre SB PW4 ENG 72-205) (Sheet 4/4)
Figure 410

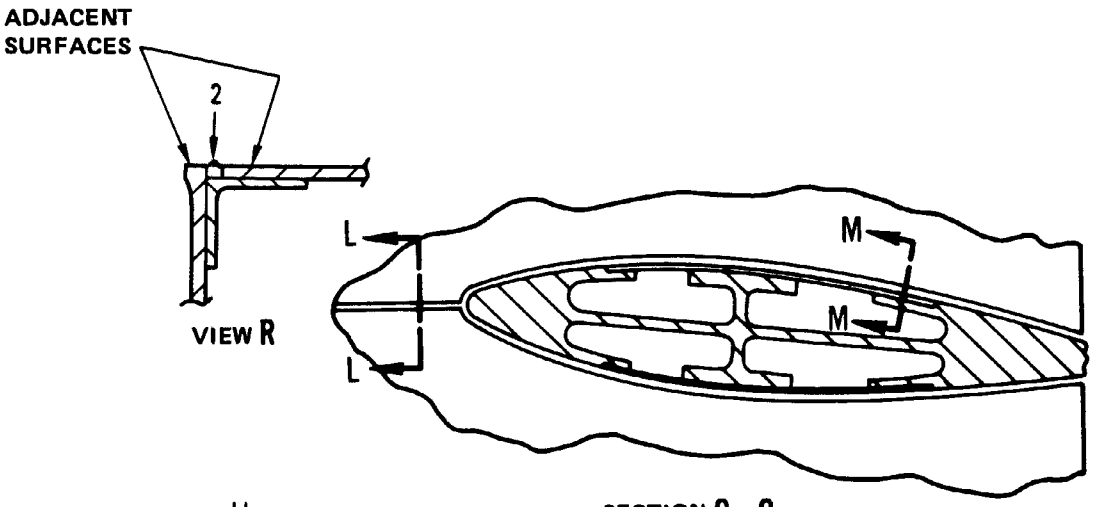


NOTE : SEE TABLE 409

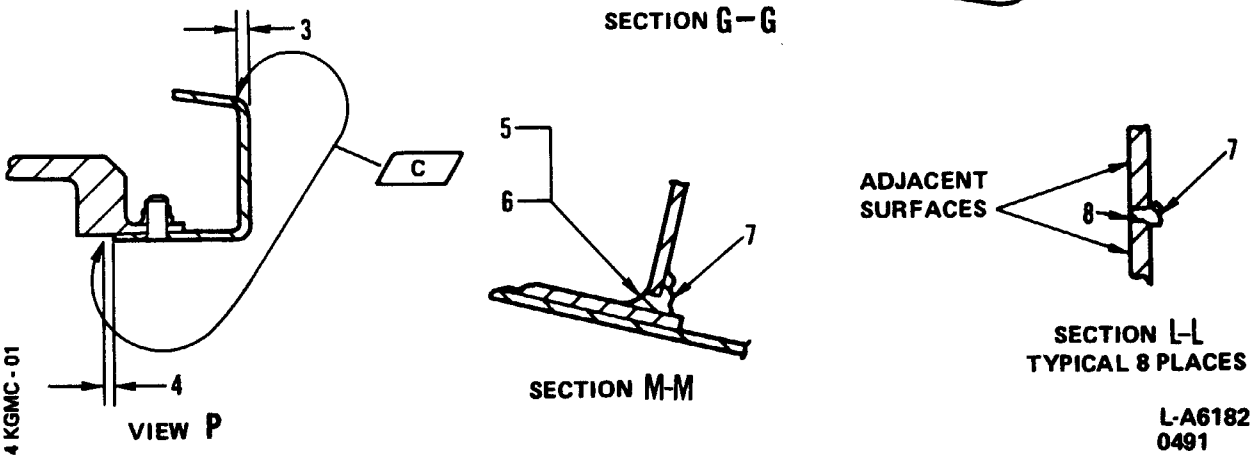
Installation of the Liners (Intermediate Cases that are Post SB PW4 ENG 72-205) (Sheet 1/3)
Figure 411



SECTION S-S



SECTION G-G



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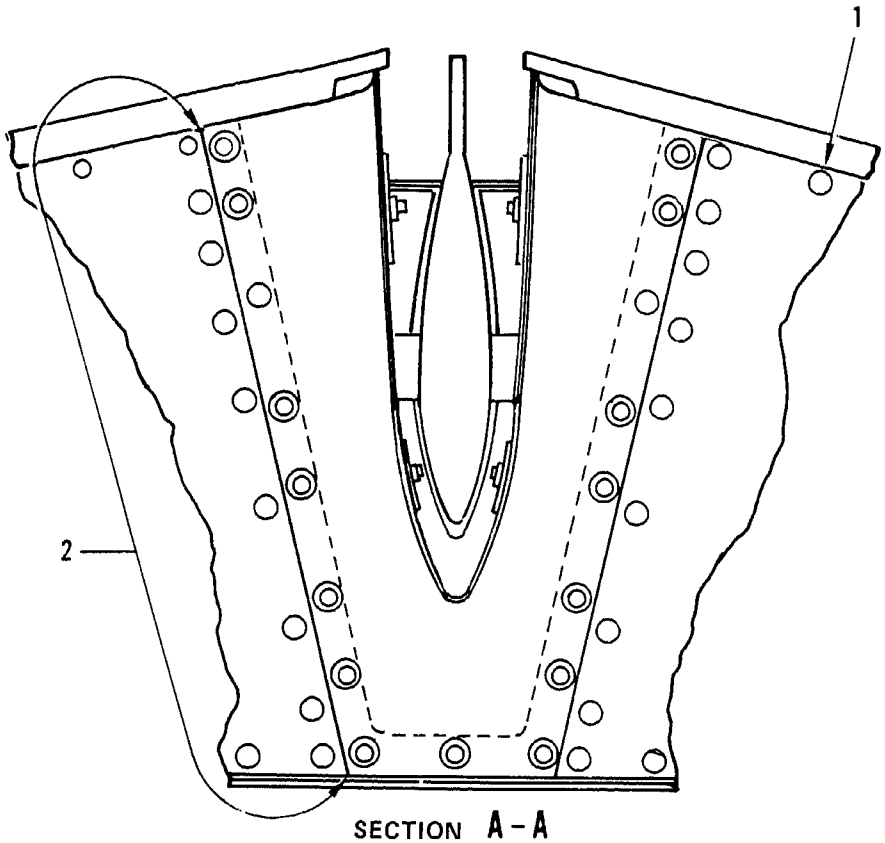
BM5 72 23 05 4 KGMC - 01

Installation of the Liners (Intermediate Cases that are Post SB PW4 ENG 72-205) (Sheet 2/3)
Figure 411



1. 18 PLACES, SEE PPIPC FOR LINER SEGMENT PN.
2. APPLY SEALANT TO THE CLEARANCE BETWEEN THE LINER AND THE FAIRING, TWO PLACES.

BM5 72 23 05 4 KGME 01

Installation of the Liners (Intermediate Cases that are Post SB PW4 ENG 72-205) (Sheet 3/3)
Figure 411

FAN EXIT LINER SEGMENTS - INSPECTION/CHECK

1. Examine the Fan Exit Liner Segments (Outer)
(Ref. Fig. 601)

A. Examine the liner segments for the indications of damage that are shown in the tables that follow. For replacement of the liner segments, (Ref. 72-23-05, P. Block 401).

EXAMINE	REPLACE IN 50 HOURS	TIGHTEN IN 50 HOURS
Liner segments : - If a part or all of the liner segment is not there	Replace the liner segment	
If loose		Tighten the screw
Screws : If not there	Replace the screw	
If loose		Tighten the screw
Inspection for parts that are not there or that are loose Table 601		

EXAMINE	DAMAGE LIMITS		
	PERMITTED	REPLACE IN 50 HOURS	REPLACE BEFORE NEXT USE
All surfaces for : Nicks, gouges.			
Width or length of damage	-	More than 1. (25.4)	-
Depth of damage	-	More than 0.03 (0.762)	-
Separation (from any other damage)	-	Less than 2. (50.8)	-
Quantity of incidents	-	More than 5.	-
Dents (with rounded bottoms)			-

	EXAMINE	DAMAGE LIMITS		
		PERMITTED	REPLACE IN 50 HOURS	REPLACE BEFORE NEXT USE
	Depth of damage	-	More than 0.030 (0.762)	-
	Total area of damage		More than 10 percent of the surface area	
	Cracks Length of damage	-	More than 1. (25.4)	-
	Separation (from the center of an attachment screw)	-	Less than 0.5 (12.7)	-
	Areas of broken or fuzzy stray fibers Width or length of damage	-	1. - 2.5 (25 - 64)	Repair or replace more than 2.5 (63.5)
	Depth of damage	-	More than 0.03 (0.762)	-
	Separation (from any other damage)	-	Less than 2. (50.8)	-
	Tears, holes, punctures in the wire mesh identations See note			
R	Total area of damage	10 percent of the surface, maximum	More than 10 percent of the surface	-
R	Area of an incident of damage	Damage that does not extend beyond the individual indentation	Damage that extends beyond the individual indentation	-
	No bond of wire cloth patch			

	EXAMINE	DAMAGE LIMITS		
		PERMITTED	REPLACE IN 50 HOURS	REPLACE BEFORE NEXT USE
R	Length or width of damage	-	More than 0.5 (12.7)	-

Inspection for nicks, dents, and other surface damage
Table 602

NOTE : The identations in the surface of the liner are formed by the wire mesh screen underneath the surface material.

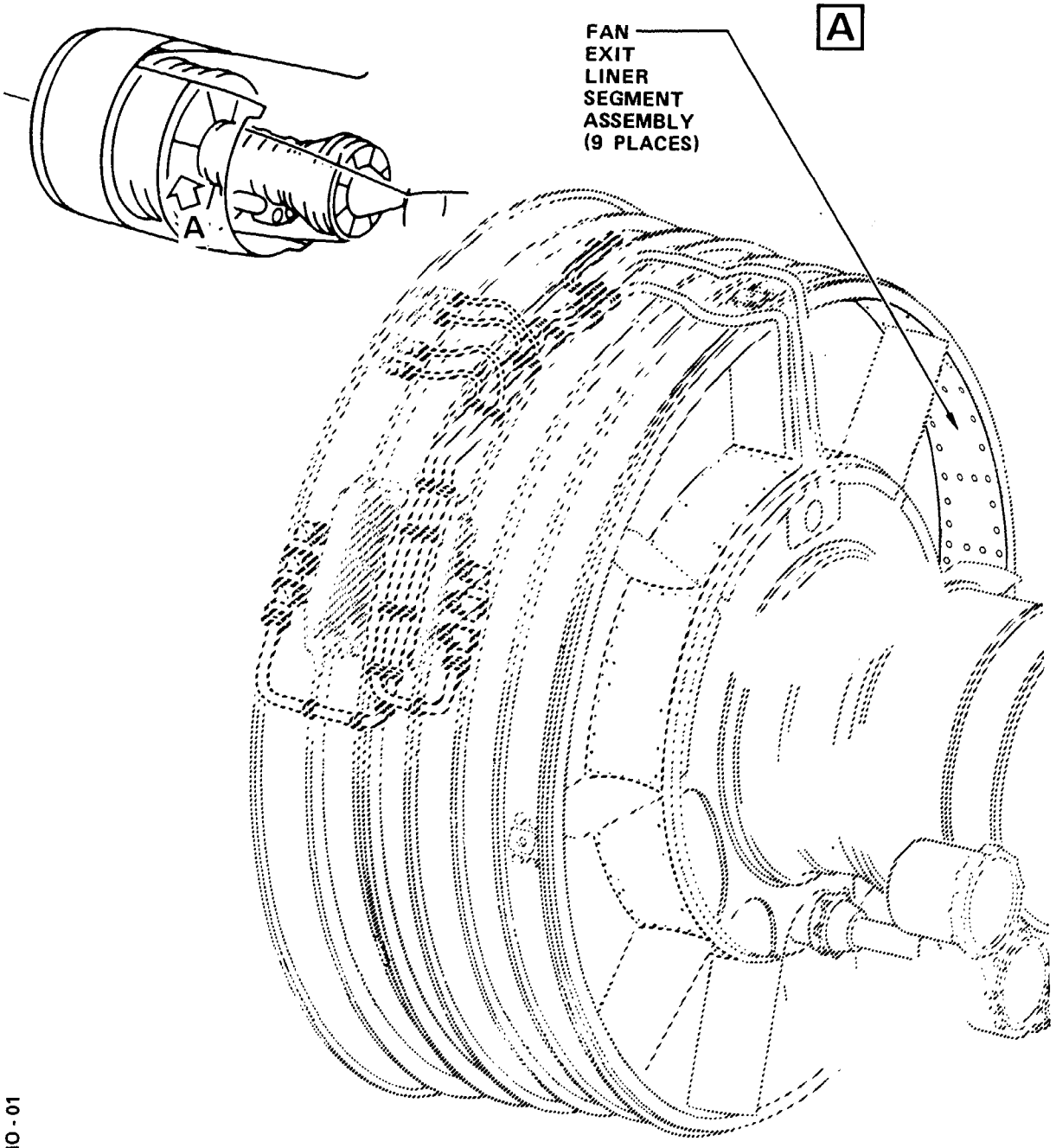
	EXAMINE FOR	DAMAGE LIMITS		
		EXAMINE EVERY 50 HOURS	REPLACE IN 50 HOURS	REPLACE BEFORE NEXT USE
	Delaminations			
	Width or length	Up to 1. (25.4)	1. - 2.5 (25 - 64)	Repair or replace more than 2.5 (63.5)
R	of damage			
R	Depth of damage	Up to 0.03 (0.762)	More than 0.03 (0.762)	-
R	Separation (from any other damage)	More than 2. (50.8)	Less than 2. (50.8)	-

Inspection for delamination
Table 603

2. Examine the Fan Exit Liner Segments (Inner Rear)
(Ref. Fig. 602, 603)

A. Examine the liner segments for the indications of damage that are shown in the tables that follow. For replacement of screws or bolts, (Ref. 72-23-05, P. Block 401) (paragraph 3.). For replacement of the liner segments or spacer plates, (Ref. 72-23-05, P. Block 401) (paragraph 4.).

(1)If you see a liner or fastener that is loose, do a check of the torque of the fastener. The minimum torque permitted is 15 lbf.in. (0.17 m.daN).



BM5 72 23 05 6 KAMO - 01

Location of the Fan Exit Liner Segment Assembly (outer)
Figure 601

EXAMINE	REPAIR BEFORE NEXT FLIGHT	REPLACE IN 50 HOURS	TIGHTEN IN 50 HOURS
Liner segments for : If a part or all of the liner segment is not there		X	
Screws and bolts for : If not there		X	
If loose			X
Ends of the rubber seal for : Cuts, tears		X	

Inspection for Parts that Are Not There, Fasteners, and Rubber Seals Table 604

EXAMINE	REPAIR BEFORE NEXT FLIGHT	REPLACE IN 50 HOURS	TIGHTEN IN 50 HOURS
Liner segments for : If a part or all of the liner segment is not there		X	
Boltholes for sealant that is not there or is very eroded		X	
Screws and bolts for : If not there		X	
If loose			X
Ends of the rubber seal for : Cuts, tears		X Repair-01	

Inspection for Parts that Are Not There, Fasteners, And Rubber Seals (Acoustical Liners) Table 605

EXAMINE	DAMAGE LIMITS		
	PERMITTED	REPLACE IN 50 HOURS In. (mm)	REPLACE BEFORE NEXT USE In. (mm)
All surfaces for : Nicks, gouges.			
Width or length of damage	-	-	More than 1.000 (25.400)
Depth of damage	-	-	More than 0.030 (0.762)
Distance (from any other damage)	-	-	Less than 2.000 (50.800)
Quantity of incidents	-	-	More than 5.
Dents (with rounded bottoms)			
Depth of damage		More than 0.030 (0.762)	
Quantity of incidents		More than 10 percent of the surface area	
Cracks			
Length of damage	-	More than 1.000 (25.400)	-
Distance (from the center of an attachment rivet, screw or bolt)	-	Less than 0.500 (12.700)	-
Areas of broken or fuzzy stray fibers			
Width or length of damage	-	1.000 - 2.500 (25 - 64)	More than 2.500 (63.500)
Depth of damage	-	More than 0.030 (0.762)	-
Distance (from any other	-	Less than 2.000 (50.800)	-

EXAMINE	DAMAGE LIMITS		
	PERMITTED	REPLACE IN 50 HOURS In. (mm)	REPLACE BEFORE NEXT USE In. (mm)
damage)			
Punctures, holes	-	None permitted	-
No bond of wire cloth patch			
Length or width of damage	-	More than 0.500 (12.700)	-
Leading edges for: Erosion (Dull or rough surface finish, fibers visible)			
Width or length of damage	Less than 0.500 (12.700)	More than 0.500 (12.700)	-

Inspection for nicks, dents, and other surface damage (Non-Acoustical Liners)
Table 606

EXAMINE	DAMAGE LIMITS		
	PERMITTED INCH (MM)	REPLACE IN 50 HOURS INCH (MM)	REPLACE BEFORE NEXT USE INCH (MM)
All surfaces for : Nicks, gouges			
Width or length of damage	-	-	More than 1.000 (25.400)
Depth of damage	-	-	More than 0.030 (0.762)
Distance (from any other damage)	-	-	Less than 2.000 (50.800)
Quantity of incidents	-	-	More than 5

EXAMINE	DAMAGE LIMITS		
	PERMITTED INCH (MM)	REPLACE IN 50 HOURS INCH (MM)	REPLACE BEFORE NEXT USE INCH (MM)
Dents (with rounded bottoms) Depth of damage	-	More than 0.030 (0.762)	-
Quantity of incidents	-	More than 10 percent of the surface area	-
Cracks In the potting compound	Permitted	-	-
On the ID surface, the length at the boltholes	-	More than 0.500 (12.700)	-
On the OD surface	Permitted if the ends of wires are not above the surface	-	-
On the ID surface (other areas) length	-	More than 1.000 (25.400)	-
Areas of broken or fuzzy stray fibers on the ID surface or broken wires on the OD surface Width or length of damage	-	1.000 - 2.500 (25 - 64)	More than 2.500 (63.500)
Depth of damage	-	More than 0.030 (0.762)	-
Distance (from any other damage)	-	Less than 2.000 (50.800)	-
Punctures, holes	-	None permitted	-

EXAMINE	DAMAGE LIMITS		
	PERMITTED INCH (MM)	REPLACE IN 50 HOURS INCH (MM)	REPLACE BEFORE NEXT USE INCH (MM)
No bond of wire cloth patch Length or width of damage	-	More than 0.500 (12.700)	-

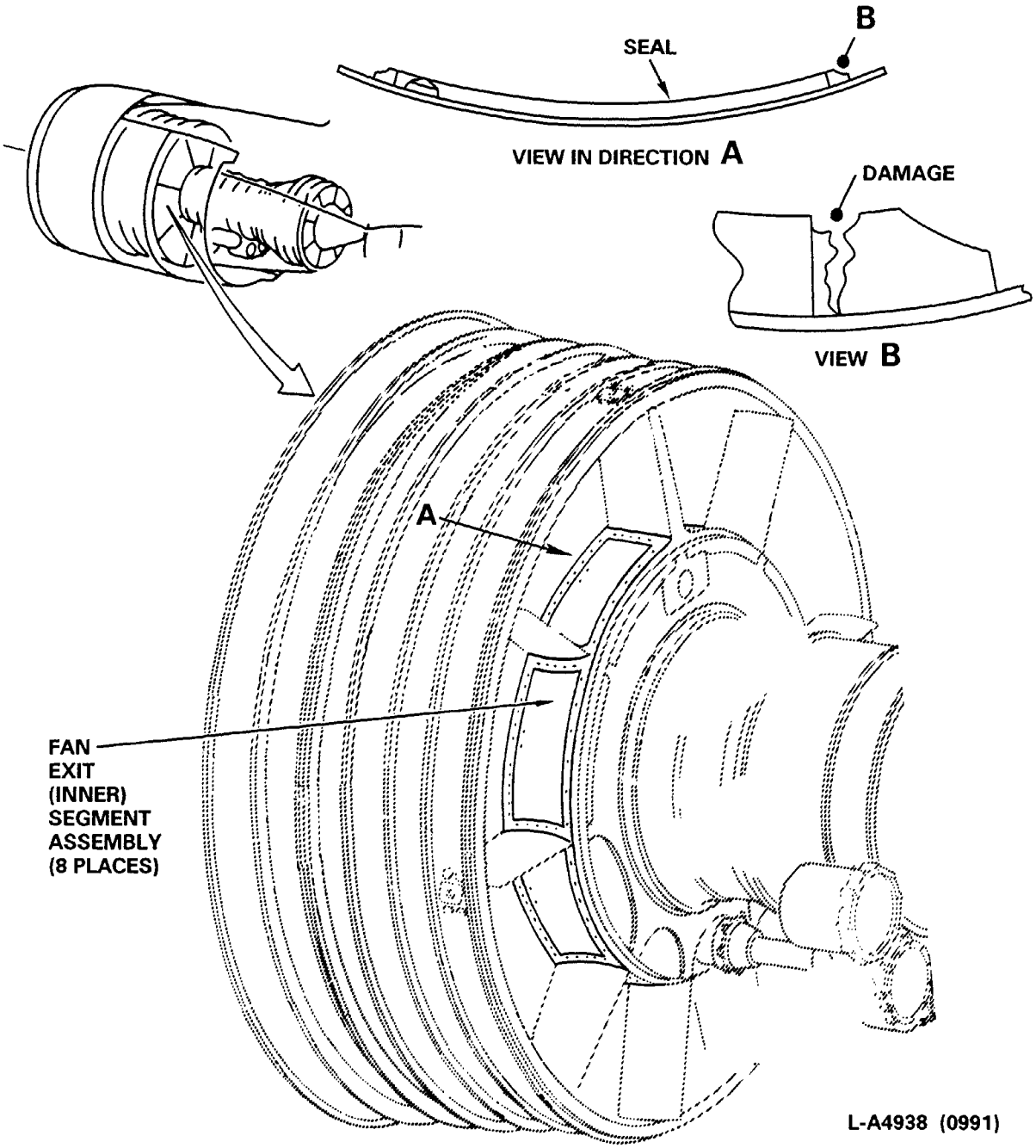
Inspection for Nicks, Dents and other Surface Damage
(Acoustical Liners)
Table 607

EXAMINE FOR	DAMAGE LIMITS		
	EXAMINE EVERY 50 HOURS In. (mm)	REPLACE IN 50 HOURS In. (mm)	REPLACE BEFORE NEXT USE In. (mm)
Delaminations Width or length of damage	Up to 1.000 (25.400)	1.000 - 2.500 (25 - 64)	More than 2.500 (63.500)
Depth of damage	Up to 0.030 (0.762)	More than 0.030 (0.762)	-
Distance (from any other damage)	More than 2.000 (50.800)	Less than 2.000 (50.800)	-

Inspection for delamination
(Non-Acoustical Liners)
Table 608

3. Examine the Fan Liner Segments (Inner Front)
(Ref. Fig. 604)

A. Examine the liner segments for the indications of damage that are shown in the tables that follow. For replacement of the liner segments, (Ref. 72-23-05, P. Block 401).



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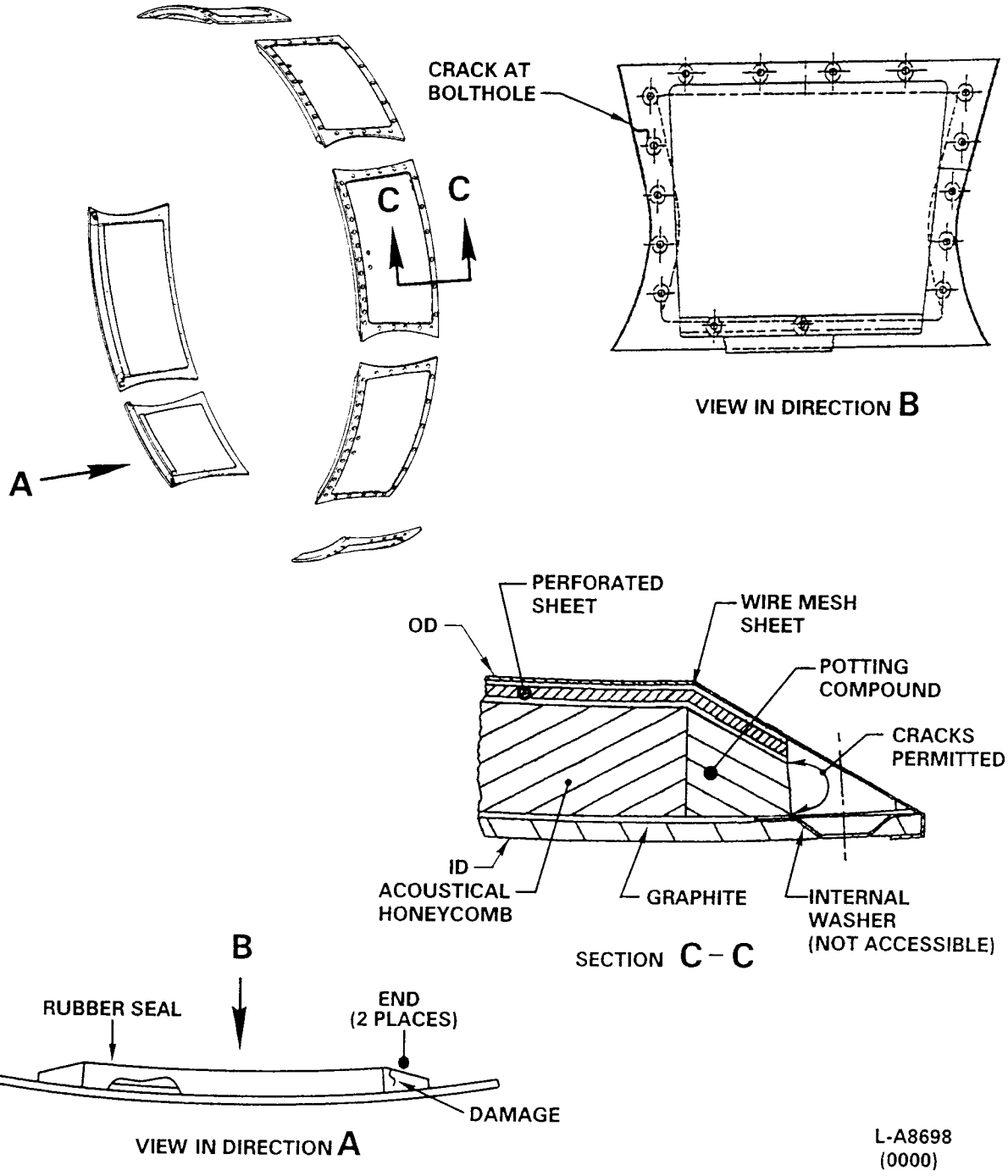
Location of the Fan Exit Liner Segment Assembly
(Inner Rear)
Figure 602



Inspection of Acoustical Liners
Figure 603

EXAMINE	REPLACE IN 50 HOURS	TIGHTEN IN 50 HOURS
Liner segments : - If a part or all of the liner segment is not there	Replace the liner segment	
Screws : - If not there	Replace the screw	
If loose		Tighten the screw
Rivets If not there or if loose	Replace the rivet	
Washers : - If not there	Replace the washer	
Inspection for parts that are not there or that are loose Table 607		

EXAMINE	DAMAGE LIMITS		
	PERMITTED	REPLACE IN 50 HOURS	REPLACE BEFORE NEXT USE
All surfaces for : Nicks, gouges.			
Width or length	-	-	More than 1. (25.4)
Depth	-	-	More than 0.03 (0.762)
Separation (from any other damage)	-	-	Less than 2. (50.8)
Number	-		More than 5.
Dents (with rounded bottoms) Depth	-	More than 0.030 (0.762)	-
Quantity		More than 10	

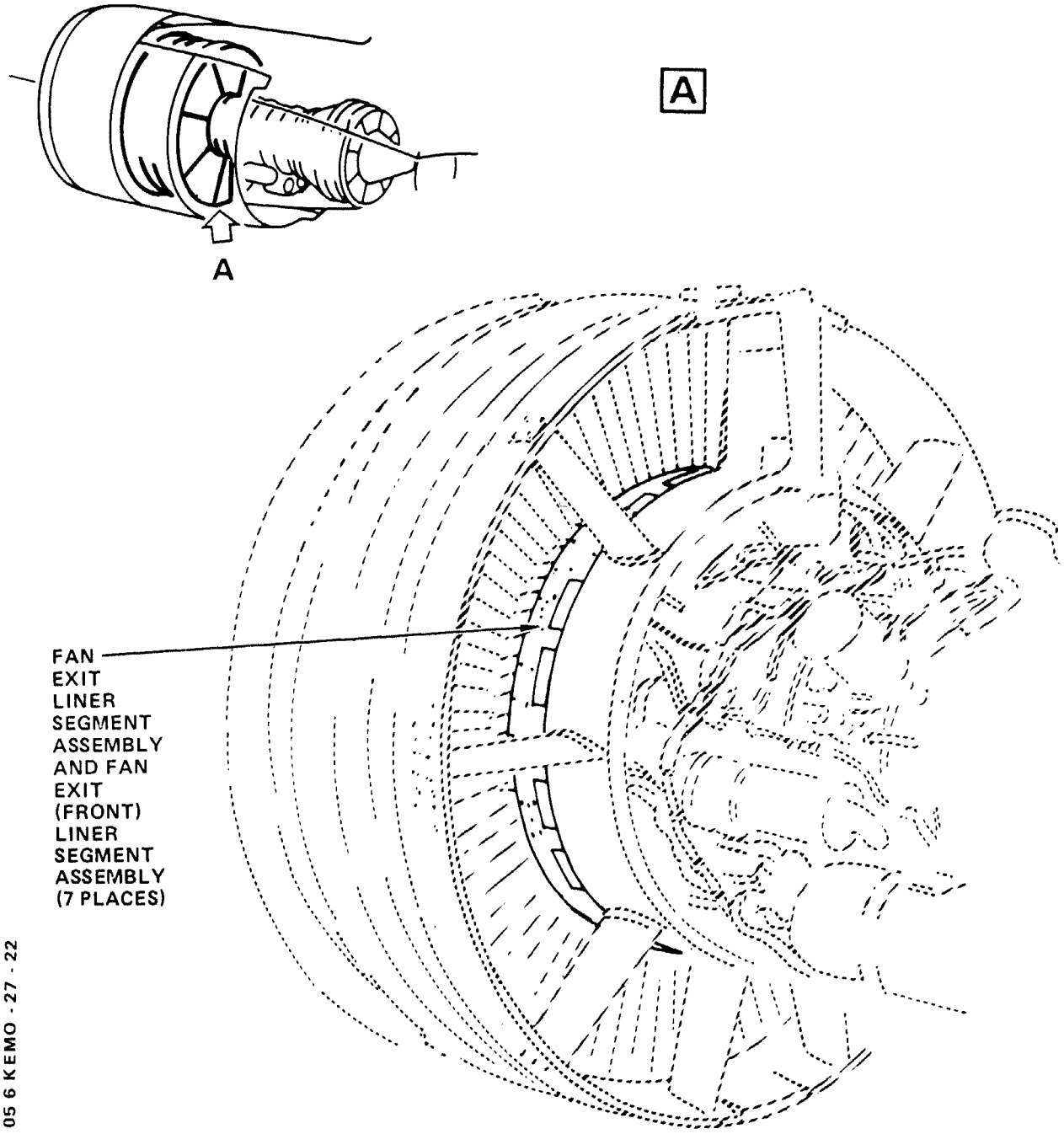
EXAMINE	DAMAGE LIMITS		
	PERMITTED	REPLACE IN 50 HOURS	REPLACE BEFORE NEXT USE
		percent of the surface area	
Cracks Length	-	More than 1. (25.4)	-
Separation (from the center of an attachment rivet or screw)	-	Less than 0.5 (12.7)	-
Areas of broken or fuzzy stray fibers Width or length	-	1. - 2.5 (25 - 64)	More than 2.5 (63.5)
Depth	-	More than 0.03 (0.762)	-
Separation (from any other damage)	-	Less than 2. (50.8)	-
Punctures, holes	-	None permitted	-
No bond of wire cloth patch Length or width	-	More than 0.5 (12.7)	-
Leading edges for: - erosion (dull or rough surface finish fibers are visible)	Any quantity	-	-
Width or length	Less than 0.5 (12.7)	More than 0.5 (12.7)	-
Length	Less than 0.750 (19.050) if there are no cracks or delamination in worn area	More than 0.750 (19.050)	-

EXAMINE	DAMAGE LIMITS		
	PERMITTED	REPLACE IN 50 HOURS	REPLACE BEFORE NEXT USE
Depth	Less than 0.020 (0.508) if there are no cracks or delamination in worn area	More than 0.750 (19.050)	

Inspection for nicks, dents, and other surface damage
Table 608

EXAMINE FOR	DAMAGE LIMITS		
	EXAMINE EVERY 50 HOURS	REPLACE IN 50 HOURS	REPLACE BEFORE NEXT USE
Delaminations Width or length	Up to 1. (25.4)	1. - 2.5 (25 - 64)	More than 2.5 (63.5)
Depth	Up to 0.03 (0.762)	More than 0.03 (0.762)	-
Separation (from any other damage)	More than 2. (50.8)	Less than 2. (50.8)	-

Inspection for delamination
Table 609



Location of the Fan Exit Liner Segment Assembly (Inner Front)
Figure 604

1. Fan Exit Liner Segments (Inner Rear)

A. Repair damaged seal ends (Ref. Fig. 801)
(1)Equipment and Materials

ITEM	DESIGNATION
A. Material No.P05-038	Special Materials (Ref. 70-00-00)
B. Material No.P09-014	Sealants (Ref. 70-00-00)
Referenced Procedure	
- 70-00-00, P. Block 201	Engine - Standard Practices

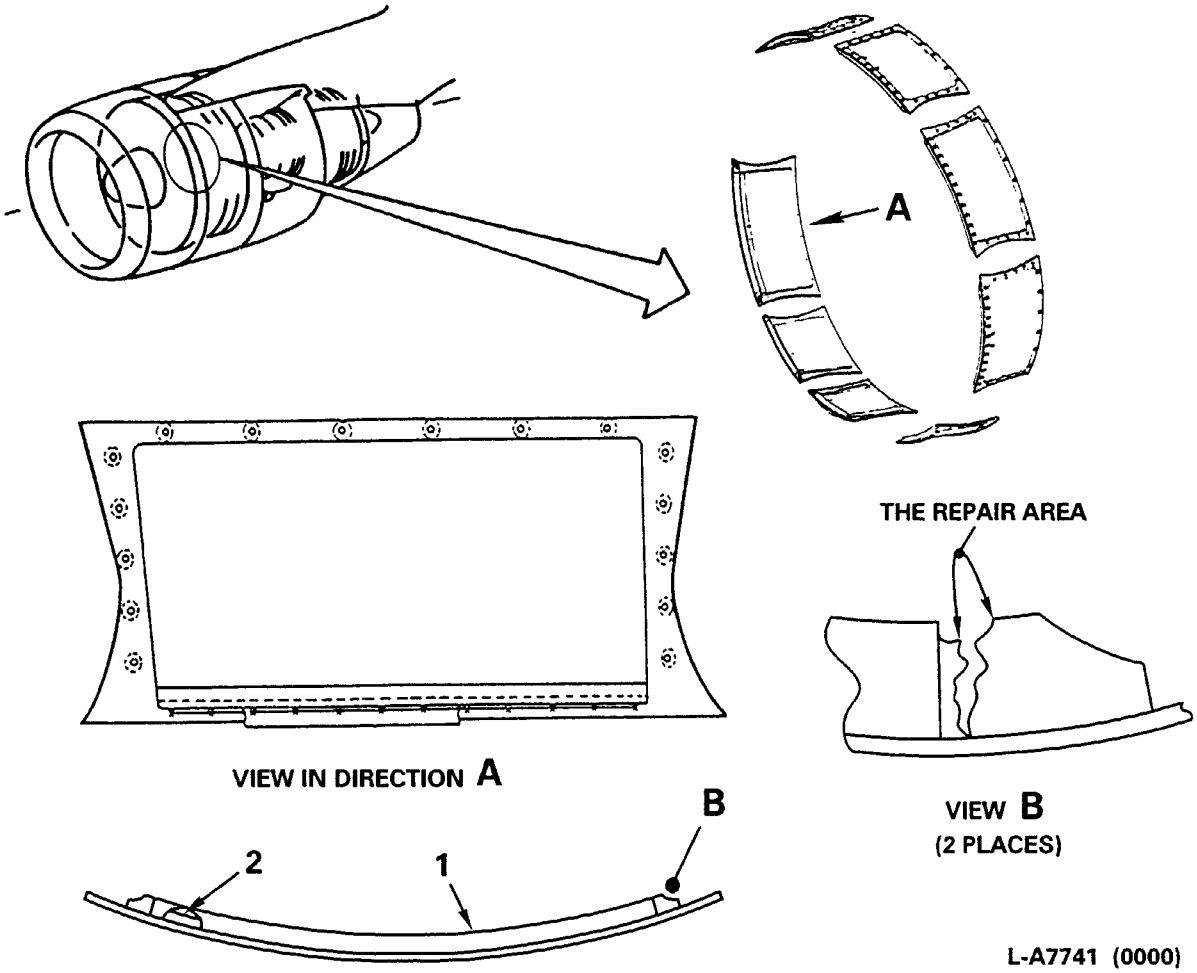
(2)Clean the surfaces you will bond. Use a clean piece of Material No.P05-038 and a SPOP 208 solvent (Ref. 70-00-00, P. Block 201). The surfaces must be fully dry before you apply the sealant.
(3)Bond the end of the seal to the liner. Use Material No.P09-014. Fill empty spaces between the seal and liner with the sealant. Press the seal and the liner together.
(4)Cure the sealant for 24 hours before you touch or move the part.

2. Fan Exit Liner Segments (Outer)

A. Fan exit liner segments (outer) epoxy repair
(1)Equipment and Materials

ITEM	DESIGNATION
A. Material No.P05-133	Special Materials (Ref. 70-00-00)
B. Material No.P08-002	Bonding and Adhesive Compounds (Ref. 70-00-00)
C. Material No.P08-012	Bonding and Adhesive Compounds (Ref. 70-00-00)
D. Material No.P08-016	Bonding and Adhesive Compounds (Ref. 70-00-00)
Referenced Procedure	
- 70-00-00, P. Block 201	Engine - Standard Practices
- 72-23-05, P. Block 401	Fan Exit Liner Segments

(2)Job set-up
(a)If necessary, remove the liner segment from the compressor intermediate case (Ref. 72-23-05, P. Block 401).
(3)Procedure (Ref. Fig. 802)
(a)Remove any remaining sealant from liner. Use a wooden or plastic scrapper. Do not cause damage to the wire mesh or liner in this process.
(b)Cut off all the loose wire mesh.
(c)Make a temporary mold or use spare liners for both sides of the repair area. A temporary mold must be made of an equivalent material. You can use the mold later to make sure that the patched area agrees with the necessary shape.
(d)Smooth out the repair area of all rough and frayed edges of the wire mesh.



1. SEAL
2. STIFFENER

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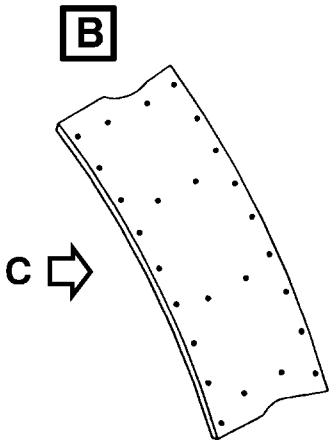
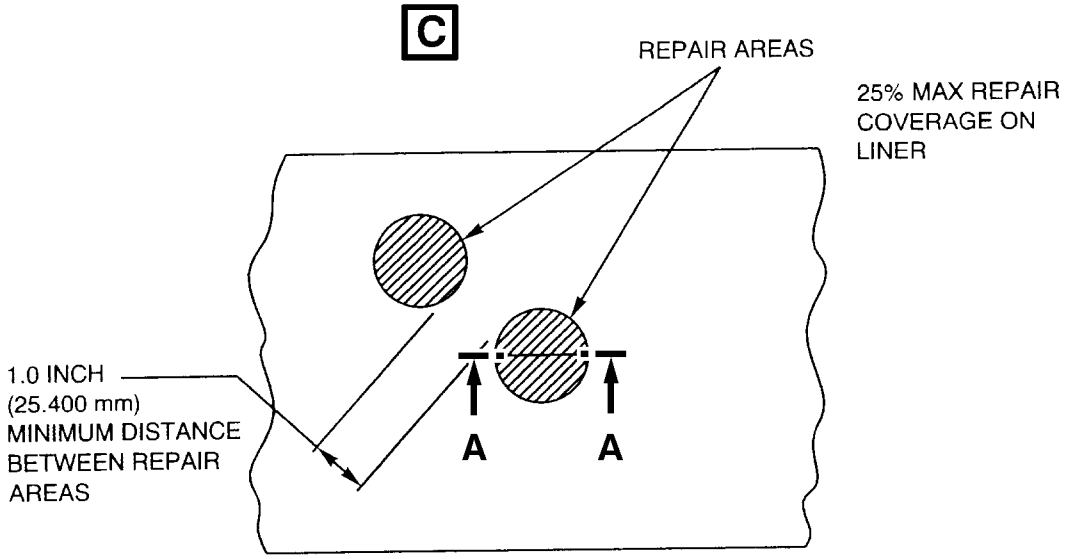
Repair of Damaged Seal Ends
Figure 801

(e)Fully mix Material No.P08-016 :
1 Mix 3 parts by weight of part A with 1 part by weight of part B.
NOTE : You must use Material No.P08-016 in 40 minutes or less.
(f)Apply Material No.P08-016 with a wooden or plastic scrapper under the wire mesh. Make sure that all edges of wire mesh are covered by Material No.P08-016.
(g)Apply Material No.P08-016 in any gaps between wire mesh and organic fiber cloth to keep the countour.
(h)Make the repair area smooth and remove unwanted Material No.P08-016.
(i)Apply a layer of Material No.P05-133 to the mold. Put Material No.P05-133 on the repaired area and clamp with sufficient pressure to hold the contour.
(j)Cure the liner at room temperature for 2 hours minimum, minimum followed by 1 hour to between 140°F and 160°F (60°C and 71°C).
(k)File or sand the repair area until you get a smooth continuous surface.
(l)Clean the surface you made rough by SPOP 208 (wipe method) (Ref. 70-00-00, P. Block 201). Permit the area to dry for a minimum of 30 minutes.
(m)Fully mix Material No.P08-002 and Material No.P08-012 as follows :
1 Mix 4 parts by weight of Material No.P08-002 with 1 part by weight of Material No.P08-012.
(n)Apply a thin layer of the mixture to the sanded area and any organic fiber cloth. This will seal the area.
(o)Cure the sealer to between 160°F and 190°F (71°C and 88°C) for 1 hour with heat gun or blanket.

(4)Close-up
(a)Install the liner segment on the compressor intermediate case (Ref. 72-23-05, P. Block 401).





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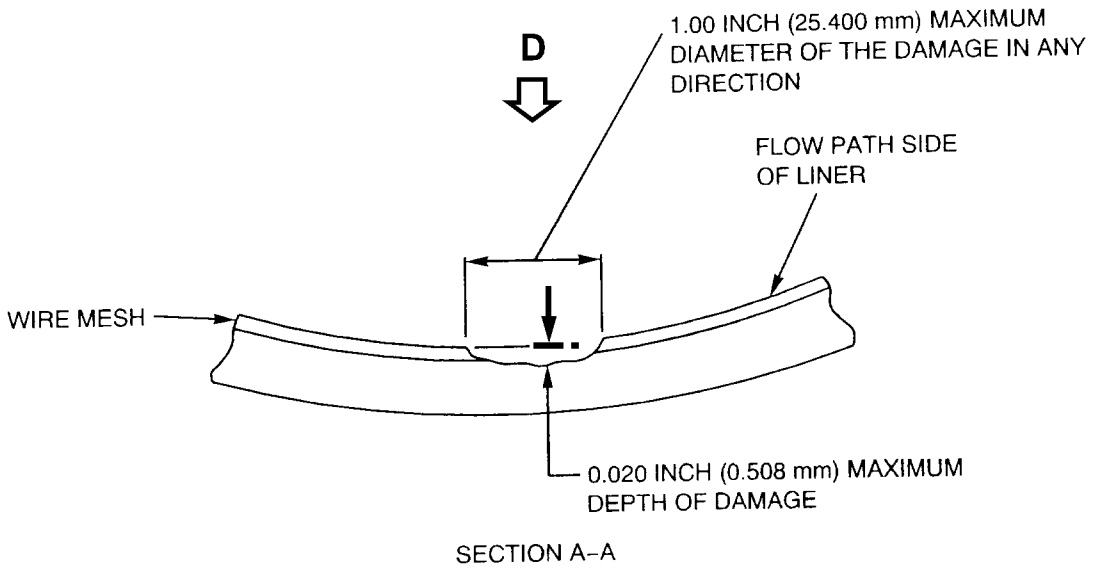
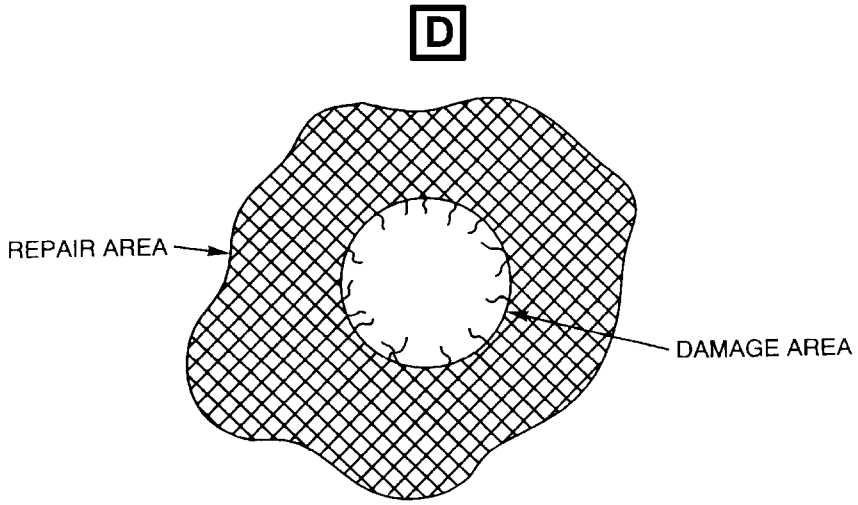
PW V

Fan Exit (Outer) Liner Wire Mesh Repair (Sheet 1/2)
Figure 802


D
1.00 INCH (25.400 mm) MAXIMUM DIAMETER OF THE DAMAGE IN ANY DIRECTION
FLOW PATH SIDE OF LINER
WIRE MESH
0.020 INCH (0.508 mm) MAXIMUM DEPTH OF DAMAGE

SECTION A-A



L-B8644 (0901)
PW V

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Fan Exit (Outer) Liner Wire Mesh Repair (Sheet 2/2)
Figure 802

FAN EXIT (BIFURCATION) FAIRING - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C.	No. 3 Cross-Drive (Phillips)
D.	No. 10 Torq-set Drive
E.	T-10 Torx Tip
F. Material No.P03-001	Oils (Ref. 70-00-00)
G. Material No.P05-038	Special Materials (Ref. 70-00-00)
H. Material No.P09-014	Sealants (Ref. 70-00-00)
I. Material No.P09-019	Sealants (Ref. 70-00-00)
J. Material No.P09-027	Sealants(Ref. 70-00-00)
K. Material No.P11-014	Cleaning Agents (Ref. 70-00-00)
L. Material No.P18-007	Primer (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 72-23-06, P. Block 801	Fan Exit (Bifurcation) Fairing

2. Procedure

A. Job Set-up
(1)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

B. Remove the fan exit (bifurcation) fairing access covers (Ref. Fig. 401).
(1)Cut and remove the sealant from around the (rear) cover plate (1). Remove the screws (3) and cover plate (1).

CAUTION : BE CAREFUL WHEN YOU REMOVE THE ACCESS COVERS. IT IS POSSIBLE THAT THERE ARE CLASSIFIED WASHERS BONDED TO BOLTHOLES (6). IT IS EASY FOR THESE WASHERS TO BECOME LOOSE.

(2)Cut and remove the sealant from around the two access covers (5). Remove the screws (4), (7) and (6) and the two access covers (5).
(3)(Post SB PW4ENG 72-370) If you replace an access cover with a new access cover, you will need to use the classified washers, if any, that are bonded to the access cover you removed. If you do not install new covers, but the washers fall off the covers or become loose, you must use the procedure in paragraph (2) to bond them to the covers.

C. Install the fan exit (bifurcation) fairing access covers.
(Ref. Fig. 401, 402)
(1)If it is necessary to install a new access cover, refer to (Ref. 72-23-06, P. Block 801) for instructions on the installation of boltholes in the cover.
NOTE : Use a No. 10 Torq-set drive to install the screws.
CAUTION : MAKE CERTAIN TO USE THE CORRECT PART NUMBER ACCESS COVER AND

COVER PLATE.
INTERCHANGEABILITY IS AFFECTED. REFER TO SB PW4ENG 72-161 AND SB PW4ENG 72-370.

(2)Install the access covers (5) and the rear cover plate (1) as follows. (Ref. Fig. 401)

(a)Install the two access covers (5) to the fan exit fairing (2) with the two screws (7) and, if applicable, two screws (4), lubricated with Material No.P03-001. If this engine is post SB PW4ENG 72-370, do the next step at the same time as you do this step.

(b)(Post SB PW4ENG 72-370) Bond classified washers to the underside of boltholes (6) as follows.

NOTE : Use this procedure for either of the two conditions that follow.
One, the access covers are the same covers you removed and they had classified washers bonded to them, but the washers fell off or are loose.
Two, the access covers are new and the replaced covers had washers bonded to them.

1 Use the same quantity of washer, in the same positions as before, on the new covers as on the old covers.

2 Clean the areas the sealant will touch with Material No.P05-038 that is wet with Material No.P11-014.

3 With Material No.P09-014 or No.P09-027, make a fillet all around the edges of the washers. Sealant is not permitted between the washers and the intermediate case nor between the washers and the access covers.

4 Cure the sealant in air that is at room temperature, and has a relative humidity of 25 percent, for two hours before you touch it.

(c)Tighten the four screws (6) against the two covers (5) and then loosen them one complete turn. Tighten the four screws (7) and (4) against the two covers (5) and then loosen them one complete turn.

(d)Install the (rear) cover plate (1) to the fan exit fairing (2) with the six screws (3), lubricated with Material No.P03-001.

(e)Tighten the screws (3) against the cover plate (1) then loosen them one complete turn. TORQUE the screws (3) to 22 lbf.in. (0.25 m.daN) plus the torque necessary to turn them through the locking feature of the nuts. The maximum torque is 40 lbf.in. (0.45 m.daN).

(f)TORQUE the four screws (6) to 22 lbf.in. (0.25 m.daN.) plus the torque necessary to turn them through the locking feature of the nuts. The maximum torque is 40 lbf.in. (0.45 m.daN).

(g)TORQUE the four screws (7) and (4) to 22 lbf.in. (0.25 m.daN) plus the torque necessary to turn them through the locking feature of the nuts. The maximum torque is 40 lbf.in. (0.45 m.daN).

(3)Apply sealant to areas AL as follows (Ref. Fig. 402).

(a)Clean the areas the sealant will touch. Use Material No.P05-038 that is wet with Material No.P11-014. Before you apply the primer, make sure there is no alcohol on the surfaces.

(b)Apply Material No.P18-007 to all cleaned surfaces.

1 It is necessary to apply the primer in less than two hours after you cleaned the area.

2 The primer must cure in air at ambient temperature for two hours, minimum. The air must have a relative humidity of 25 percent, minimum.

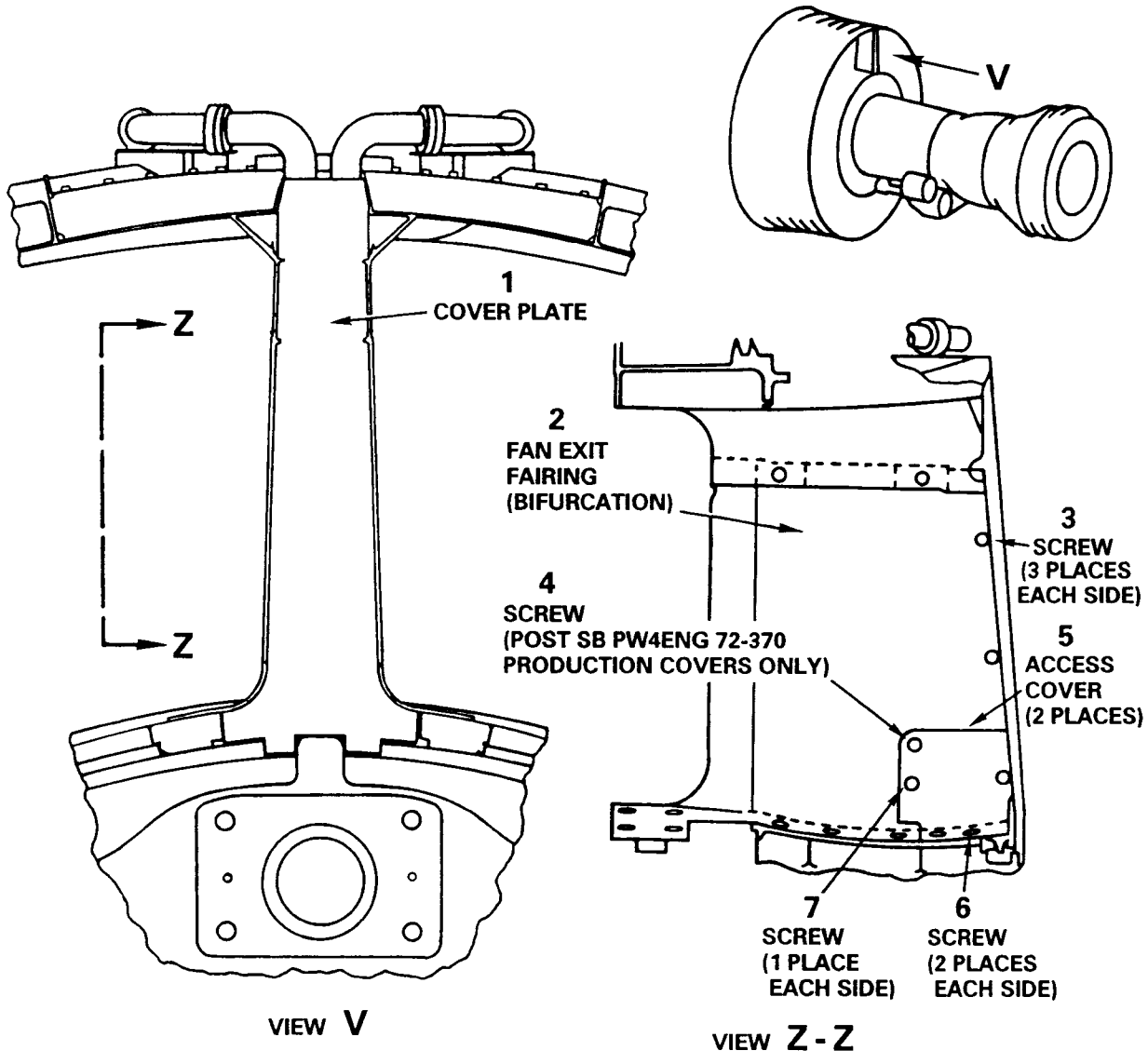
(c)Apply Material No.P09-019.

1 It is necessary to apply the sealant from 2 - 24 hours after you applied the primer.
2 Use a hot air gun at 175° - 225°F (79° - 107°C) for 5 - 7 minutes to dry the sealant.
3 After the hot air gun, cure the sealant in air that has a relative humidity of 25 percent, minimum, for eight hours, minimum, before you touch the parts.

(4)Apply Material No.P09-014 or P09-027 to Area AM :
(a)Clean the areas the sealant will touch. Use Material No.P05-038 that is wet with Material No.P11-014. Before you apply the sealant, make sure there is no alcohol on the surfaces.
(b)Apply the sealant. Cure the sealant in air for two hours, minimum, and until no longer tacky before you touch the parts. We recommend that you cure the sealant for eight hours, total, before operation of the engine.

D. Remove the fan exit (bifurcation) fairing assemblies (Post SB PW4ENG 72-370) (Ref. Fig. 403).
NOTE : Unless otherwise specified, use a No. 3 cross-drive with the shoulder screws and use a No. 10 Torq-set drive with all the other screws.
(1)Cut and remove the sealant from around the cover plate (10). Remove the screws (11) and the cover plate.
(2)Cut and remove the sealant from around the access covers (8). Remove the screws (9), (9A), and (7) and the access covers. Remove the classified washers, if any, that are under boltholes (7).
(3)Cut and remove the sealant from around the top of the outer fairing (1). Remove the screws (12) and (13), and (14) and the outer fairing.
CAUTION : BE VERY CAREFUL WHEN YOU REMOVE A LEADING EDGE. IT IS POSSIBLE THAT THERE ARE WASHERS ATTACHED TO THE LEADING EDGE. IT IS EASY FOR THESE WASHERS TO BECOME DISCONNECTED FROM THE LEADING EDGE.
(4)Cut and remove the sealant around the inner fairing (leading edge) (2). Remove the screws (4) and (15). Remove the inner fairing (leading edge).
NOTE : Use a Torx T-10 tip with screws (4).
(5)Cut and remove the sealant around the inner fairing (side panels) (6). Remove the screws (5) and (6). Remove the side panels. Remove the classified washers, if any, that are under boltholes (5) and (6).
(6)Remove the gasket (16).

E. Install the fan exit (bifurcation) fairing assemblies (Post SB PW4ENG 72-370).
(1)If it is necessary to install a new access cover, refer to (Ref. 72-23-06, P. Block 801) for instructions on the installation of boltholes in the cover.
NOTE : Unless otherwise specified, use a No. 3 cross-drive with the shoulder screws and a No. 10 Torq-set drive with all the other screws.
CAUTION : BE SURE TO USE THE CORRECT PART NUMBERS. INTERCHANGEABILITY IS AFFECTED. REFER TO SB PW4ENG 72-161 AND PW4ENG 72-370.



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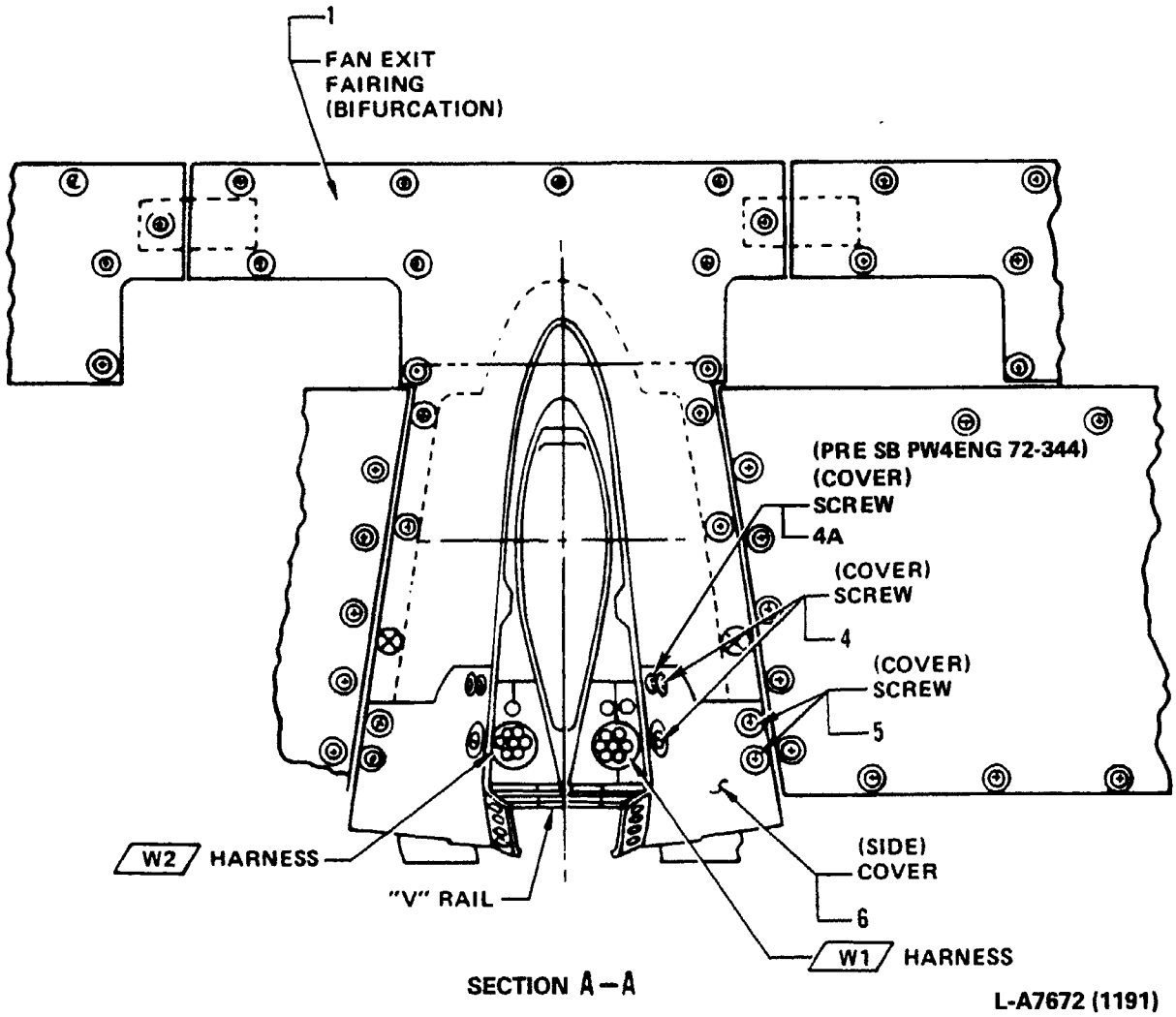
Fan Exit Fairing (Bifurcation) (Sheet 1/2)
Figure 401



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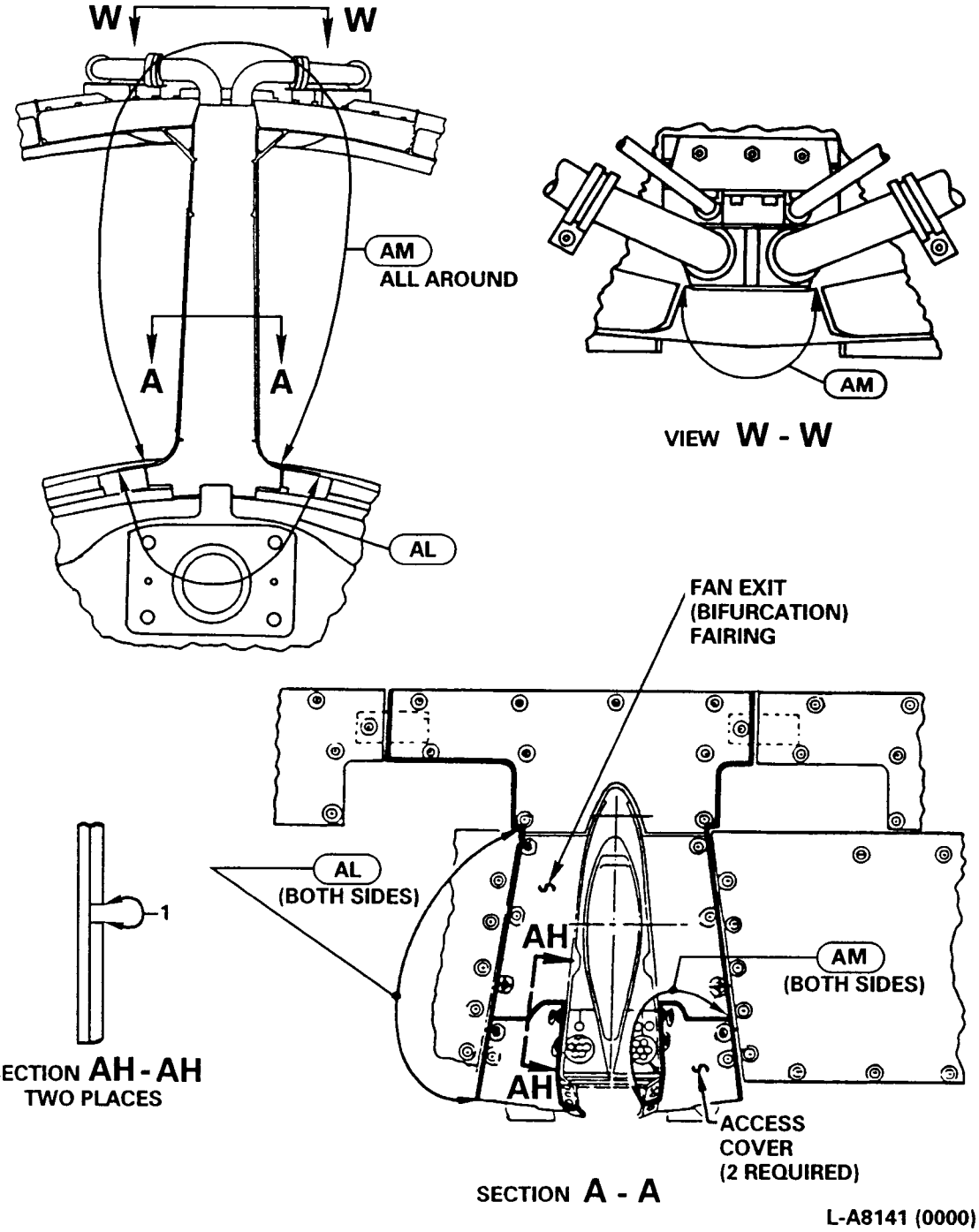
Fan Exit Fairing (Bifurcation) (Sheet 2/2)
Figure 401



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1. APPLY SEALANT. THE SEALANT MUST BE CONTINUOUS WITH, TO 0.010 IN. (0.254 mm) BELOW, TWO PLACES.

Fan Exit Fairing (Bifurcation) Sealant Areas
Figure 402

(2)Install the fairings loosely (Ref. Fig. 403).
(a)Install the gasket (16), open end rearward, around the bottom of the 12 o'clock strut.
(b)Install the left and right fan exit inner (bifurcation) fairing side panels (called side panels) (3) over the gasket. Install the countersunk screws (5), lubricated with Material No.P03-001, in the four forward boltholes. Tighten the screws with your hand.
CAUTION : BE SURE TO USE THE CORRECT PART NUMBERS. INTERCHANGEABILITY IS AFFECTED. REFER TO SB PW4ENG 72-161 AND PW4ENG 72-370.
(c)Install the fan exit inner (bifurcation) fairing leading edge (called leading edge) (2) to overlap the side panels. Be sure the forward ends of the leading edge overlap the previously installed front liner segments correctly.
1 Attach the leading edge to the case. Install the screws (15), lubricated with Material No.P03-001, in the boltholes. Tighten the screws with your hand.
2 Attach the leading edge to the side panels. Install the screws (4), lubricated with Material No.P03-001, in the boltholes. Tighten the screws with your hand.
(d)Attach the two access covers (8) with screws (7) and (9), and if applicable (9A), lubricated with Material No.P03-001. Tighten the screws with your hand.
NOTE : The side panels, leading edge, and access covers together are called the inner fairings.
(e)Install the two shoulder screws (6), lubricated with Material No.P03-001, in the side panels. Tighten the shoulder screws against the panels (3).
(f)Tighten the countersunk screws (5) of the side panels.
(g)Tighten the screws (4) and (15) of the leading edge.
NOTE : Use Torx tip T-10 with screws (4).
(h)Tighten the screws (7), (9) and if applicable (9A), of the access covers against the covers (8).
(3)(Reference 1012) Do a check of the clearance between the trailing edge of the leading edge and the leading edge of the side panels. (Ref. Fig. 404)
NOTE : This check is not necessary if the (rear) liner is an acoustical (hush-kit) liner.
(4)Where the clearance is not correct, attach washers to the boltholes at the trailing edge of the leading edge as follows. Ref. to Table 401 for washer thicknesses.

Class	Washer Thickness - Inch (mm)
1	0.009 - 0.011 (0.229 - 0.279)
2	0.019 - 0.021 (0.483 - 0.503)
3	0.029 - 0.031 (0.737 - 0.787)
4	0.039 - 0.041 (0.991 - 1.041)
5	0.049 - 0.051 (1.244 - 1.295)
6	0.099 - 0.101 (2.514 - 2.565)

Washer Thickness
Table 401

(a)Remove the screws from the trailing edge of the leading edge.
(b)Clean the washers and the area around the boltholes. Use a clean piece of Material No.P05-038 that is moist with Material No.P11-014. Dry the surfaces fully in air that is at room temperature. There must be no alcohol on the parts when sealant is applied.
(c)Put the washers in the correct position on the fairing. Install screws if necessary.
(d)Bond the washers to the fairing with a fillet of Material No.P09-014 or No.P09-027 all around. Cure the sealant in air that is at room temperature for two hours, minimum, and until no longer tacky, before you touch it.
NOTE : It is permitted to have a very small quantity of sealant between the washer and the fairing.
(e)Attach the trailing edge of the leading edge with screws, threads lubricated with Material No.P03-001. Ref. to Table 402 for screw lengths. Tighten the screws against the fairing.

Screw PN	Screw Length	Washer Thickness	Quantity of Screws
593111	0.495 - 0.505	0.000 - 0.015	0 - 2 As Necessary
ST1382-09	0.542 - 0.562	0.016 - 0.070	0 - 2 As Necessary
ST1382-10	0.594 - 0.625	0.071 - 0.130	0 - 2 As Necessary
ST1382-11	0.656 - 0.687	0.131 - 0.210	0 - 2 As Necessary

Washer Thickness and Screw Lengths
Table 402

(5)Continue to install the fairings loosely (Ref. Fig. 403).
(a)Loosen screws (6), (5), (15), (4), (7) and (9) one full turn.
(b)Install the fan exit outer (bifurcation) fairing assembly (called outer fairing) (1). Attach the outer fairing to the inner fairings with screws (12), lubricated with Material No.P03-001. Tighten the screws with your hand.
(c)Attach the outer fairing (1) to the outer case with the screws (14) and shoulder screws (13), lubricated with Material No.P03-001. Tighten the screws with your hand.
(d)Tighten all the outer fairing screws (13), (14) and (12) in the same sequence given. Loosen all the screws (13), (14) and (12) in the same sequence given, one full turn.
(e)Install the cover plate (10). Attach the cover plate to the inner and outer fairings with screws (11), lubricated with Material No.P03-001. Tighten the screws against the cover, then loosen them one full turn.
(f)The fairings must be sufficiently loose to permit radial movement. If they are not, loosen the screws another quarter turn.
(6)(Reference 1010) Torque the cover plate screws (11).
(a)TORQUE the cover plate screws (11) to 22 lbf.in. (0.25 m.daN) plus the torque necessary to turn the screw through the self-locking feature. The maximum torque is 40 lbf.in. (0.45 m.daN).
(7)(Reference 1010) Adjust the height of the fairings/cover plate as follows (Ref. Fig. 405).
(a)Lower the fairings/cover plate assembly against the intermediate case platform, while you keep to the dimensions in (Ref. Fig. 405).

(b)If there are gaps under the flaps of the side panels and access covers, install washers at the screws called BH.
(c)Bond the classified washers to the underside of boltholes BH.
1 Clean the bond areas with Material No.P11-014.
2 With Material No.P09-027 or P09-014, make a fillet all around the edges of the washers. Sealant is not permitted between the washers and the intermediate case nor between the washers and the fairings.
3 Cure the sealant in air that is at room temperature, and has a relative humidity of 25 percent, for two hours before you touch it.

(8)(Reference 1010) Torque the remaining screws as follows.
(Ref. Fig. 403)
(a)TORQUE the access cover screws (9) and, if applicable (9A), to 22 lbf.in. (0.25 m.daN) plus the torque necessary to turn the screw through the self-locking feature. The maximum torque is 40 lbf.in. (0.45 m.daN).
(b)TORQUE the two shoulder screws (6) in the side panels to 22 lbf.in. (0.25 m.daN) plus the torque necessary to turn the screw through the self-locking feature. The maximum torque is 95 lbf.in. (1.07 m.daN).
(c)TORQUE the inner fairing screws (5), (15) and (7) that attach the fairings/access covers to the case to 22 lbf.in. (0.25 m.daN) plus the torque necessary to turn the screw through the self-locking feature. The maximum torque is 40 lbf.in. (0.45 m.daN).
(d)TORQUE the two shoulder screws (13) in the outer fairing to 22 lbf.in. (0.25 m.daN) plus the torque necessary to turn the screw through the self-locking feature. The maximum torque is 95 lbf.in. (1.07 m.daN).
(e)Torque the remaining outer fairing screws (14) that attach the outer fairing to the case. TORQUE them to 22 lbf.in. (0.25 m.daN) plus the torque necessary to turn the screw through the self-locking feature. The maximum torque is 40 lbf.in. (0.45 m.daN).
(f)Examine the position of the cover plate to be sure that the dimensions in (Ref. Fig. 405) are still true. If necessary, loosen all the screws but the cover plate screws (11) and start again at step (7).
(g)TORQUE the leading edge screws (4) that attach the leading edge to the side panels to 22 lbf.in. (0.25 m.daN) plus the torque necessary to turn the screw through the self-locking feature. The maximum torque is 40 lbf.in. (0.45 m.daN).
NOTE : Use Torx tip T-10.
(h)TORQUE the outer fairing screws (12) that attach the outer fairing to the inner fairings to 22 lbf.in. (0.25 m.daN) plus the torque necessary to turn the screw through the self-locking feature. The maximum torque is 40 lbf.in. (0.45 m.daN).

(9)Apply sealant to Area AL (Ref. Fig. 406).
(a)Clean the areas the sealant will touch. Use Material No.P11-014.
(b)Apply Material No.P18-007 to all cleaned surfaces.
1 It is necessary to apply the primer in less than two hours after you cleaned the area.
2 The primer must cure in air at ambient temperature for two hours, minimum. The air must have a relative humidity of 25 percent, minimum.
(c)Apply Material No.P09-019
1 It is necessary to apply the sealant from 2 - 24 hours after you applied the primer.

2 Use a hot air gun at 175° - 225°F (79° - 107°C) for 5 - 7 minutes to dry the sealant.

3 After the hot air gun, cure the sealant in air that has a relative humidity of 25 percent, minimum, for eight hours, minimum, before you touch the parts.

(10)Apply sealant to Area AM :

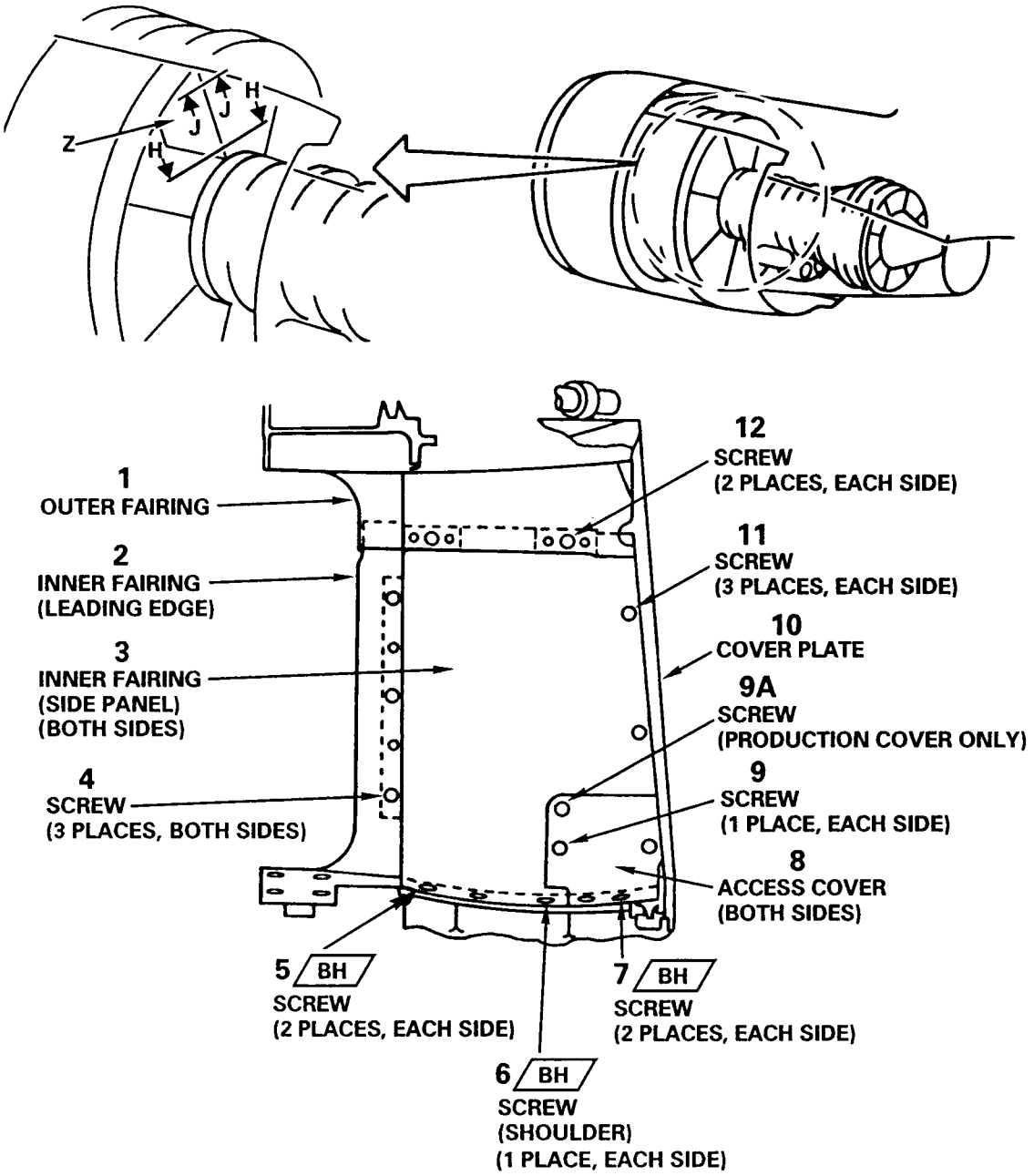
(a)Clean the areas the sealant will touch. Use Material No.P11-014.

(b)Apply Material No.P09-027 or P09-014. Cure the sealant in air that is at room temperature, and has a relative humidity of 25 percent, minimum, for two hours, minimum, and until no longer tacky, before you touch the parts. It is recommended that you cure the sealant for eight hours, minimum, before operation of the engine.

F. Close-Up

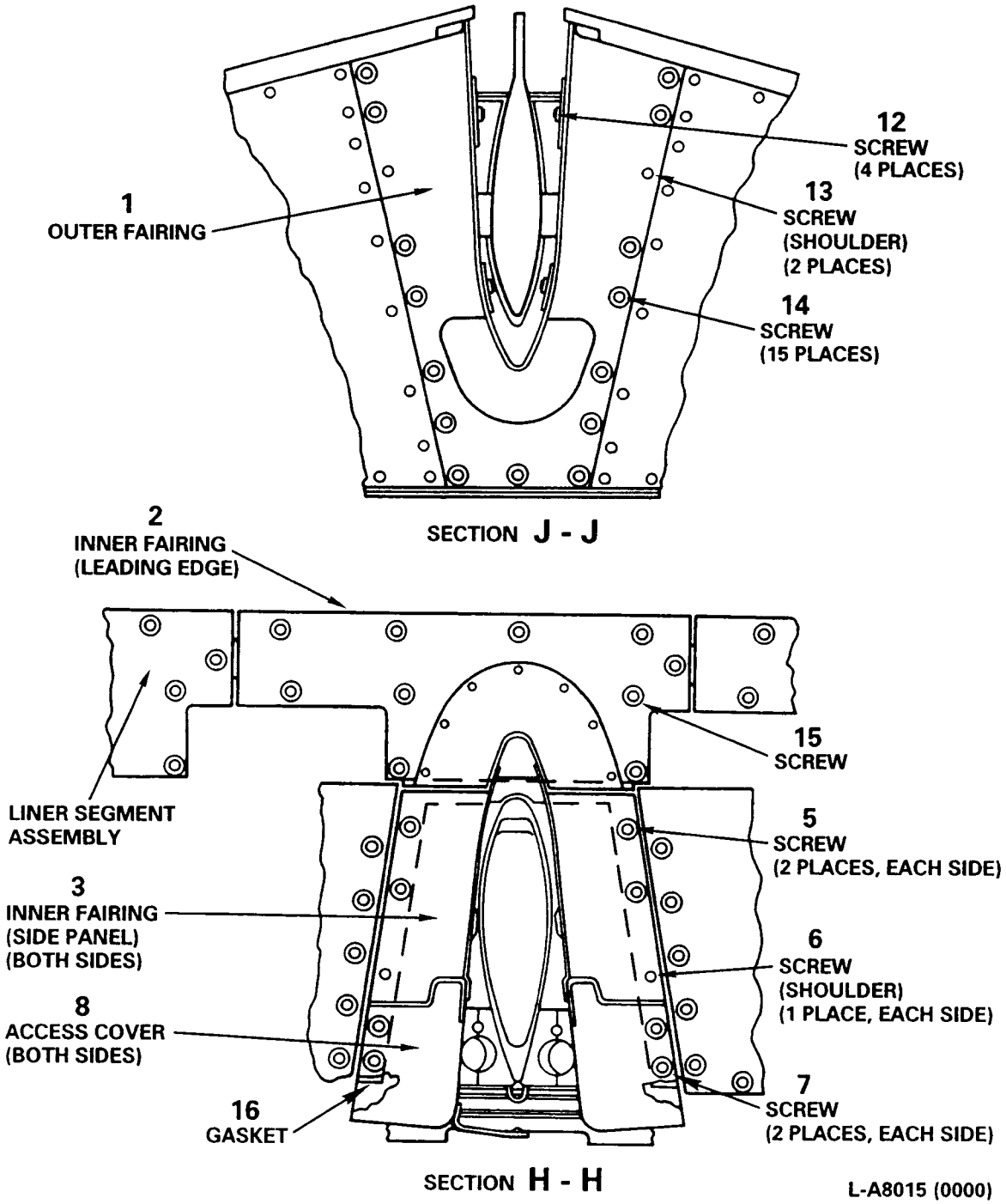
(1)Remove access platform.

(2)Close thrust reverser and fan cowl doors, and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



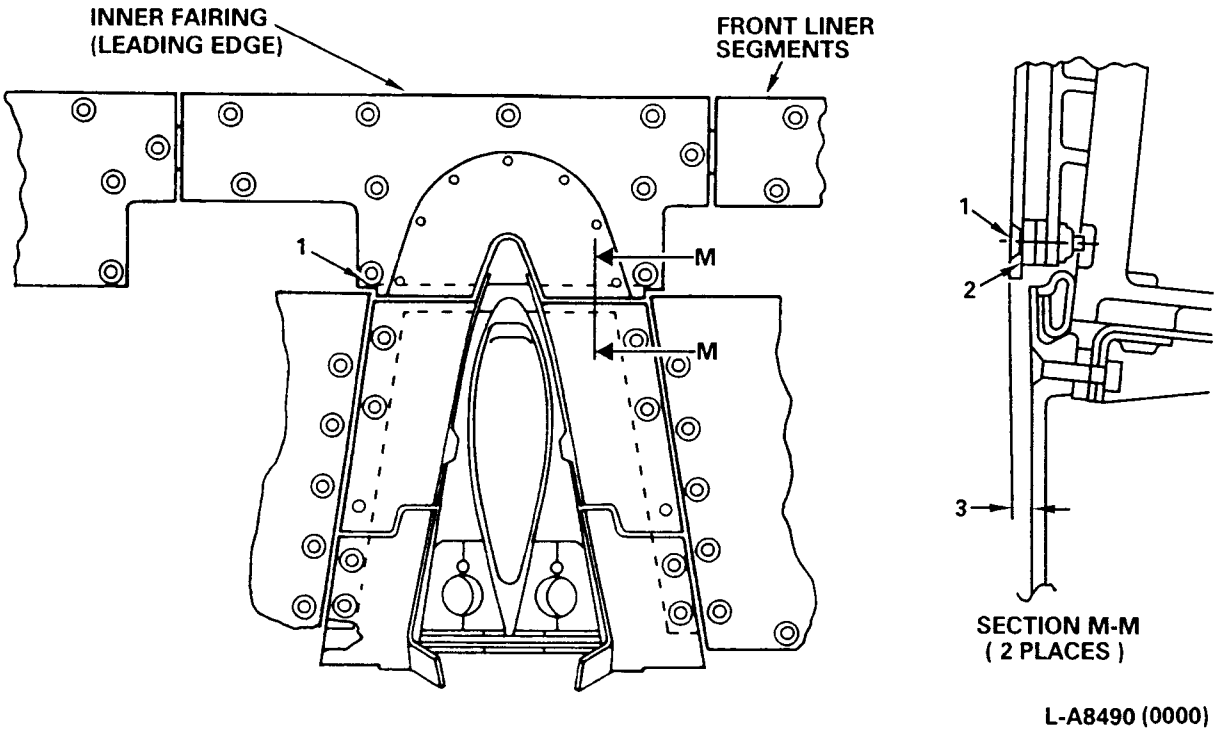
BM5 72 23 06 4 KEMA - 01

Fan Exit (Bifurcation) Fairing Assembly (Sheet 1/2)
Figure 403



BM5 72 23 06 4 KEME - 00

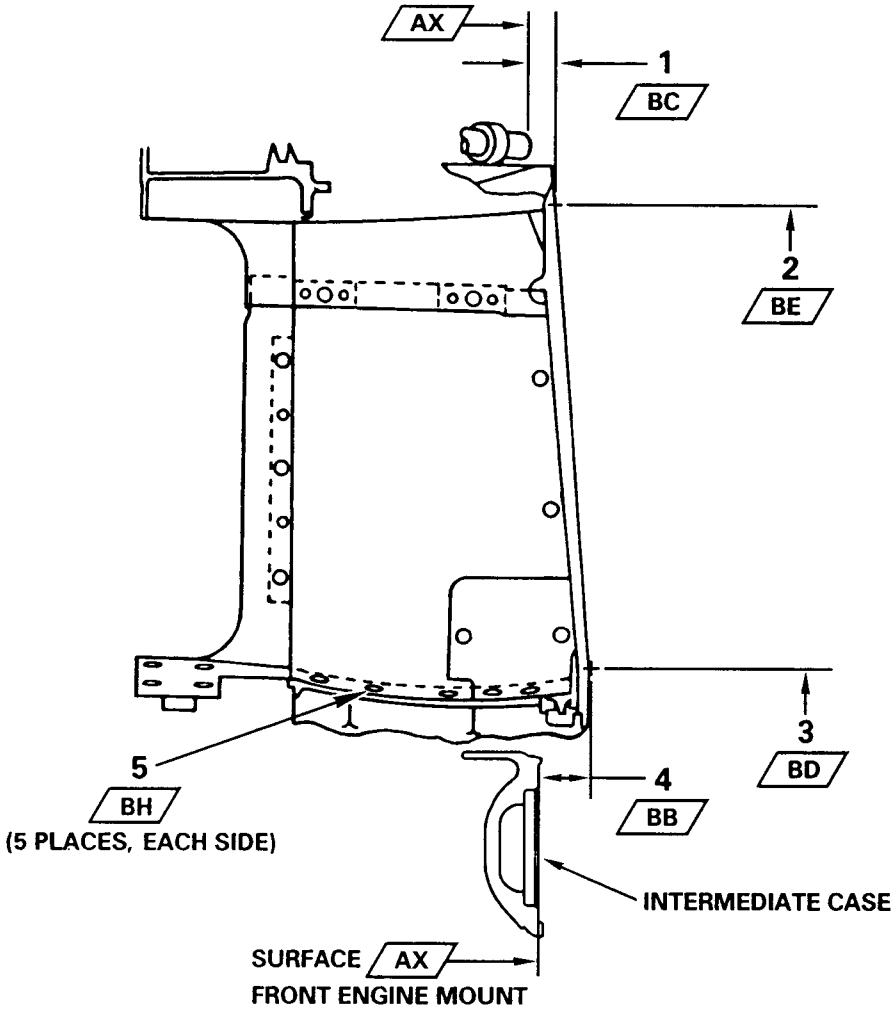
Fan Exit (Bifurcation) Fairing Assembly (Sheet 2/2)
Figure 403



1. TRAILING EDGE SCREWS, 2 PLACES. CHOOSE THE CORRECT SCREW.
2. WASHERS, 2 PLACES POSSIBLE. CHOOSE THE CORRECT CLASS AND QUANTITY (0 - 4).
3. 0.000 - 0.040 IN. (0.00 - 1.02 MM) CLEARANCE NECESSARY.

BM5 72 23 06 4 KFMO - 01

Inspection of the Clearance Between the Leading Edge and the Side Panels
Figure 404



VIEW Z

1. 0.345 - 0.445 IN. (8.8 - 11.3 mm)
2. 44.720 IN. (1135.888 mm) TO THE ENGINE CENTERLINE
3. 28.120 IN. (714.248 mm) TO THE ENGINE CENTERLINE
4. 1.620 - 1.720 IN. (41.1 - 43.7 mm)
5. CHOOSE THE CORRECT CLASS OF WASHER, 0 TO 3 UNITS AS NECESSARY, AT POSITIONS BH. THE TOTAL HEIGHT MUST NOT BE MORE THAN 0.253 IN. (6.426 mm).

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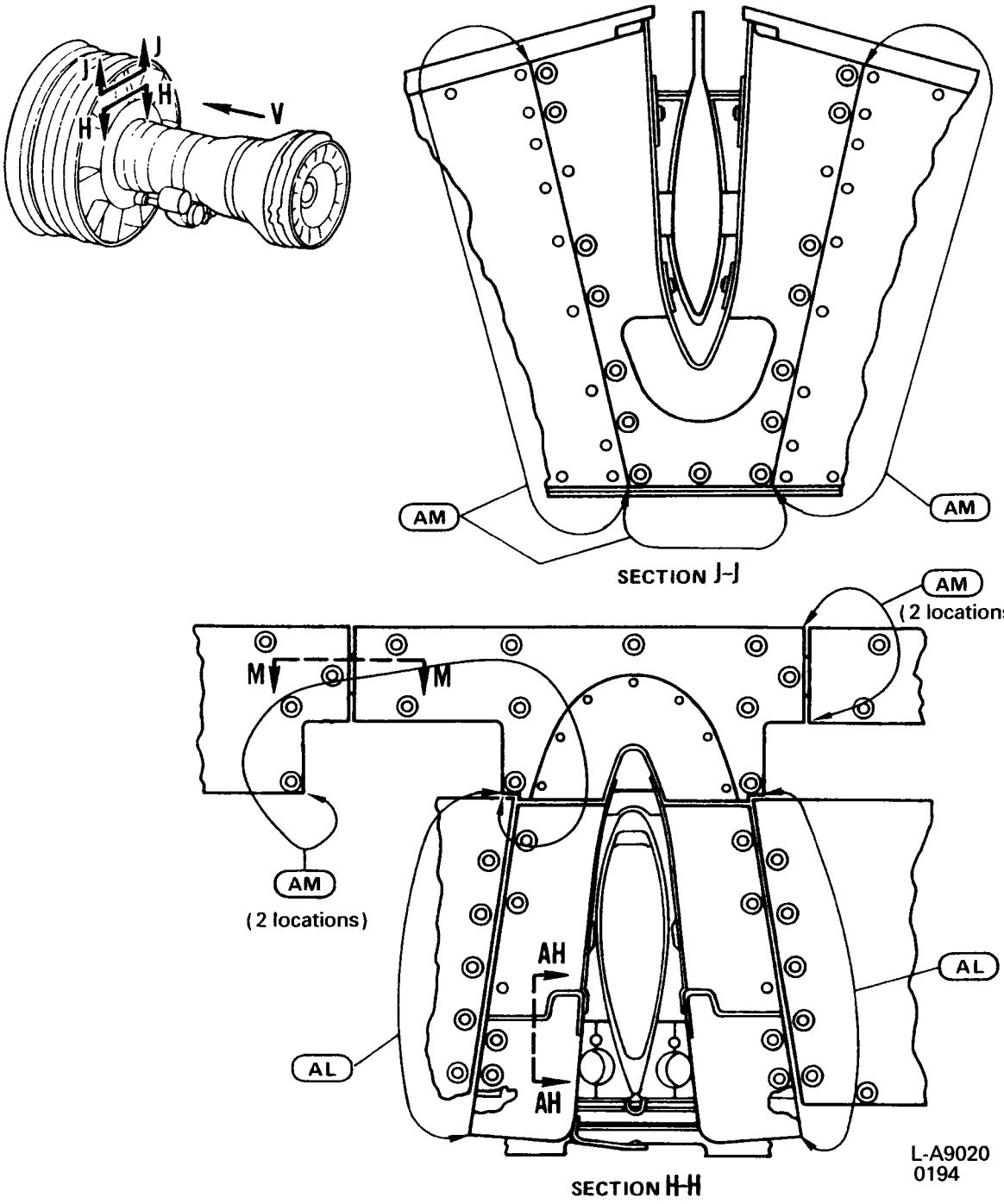
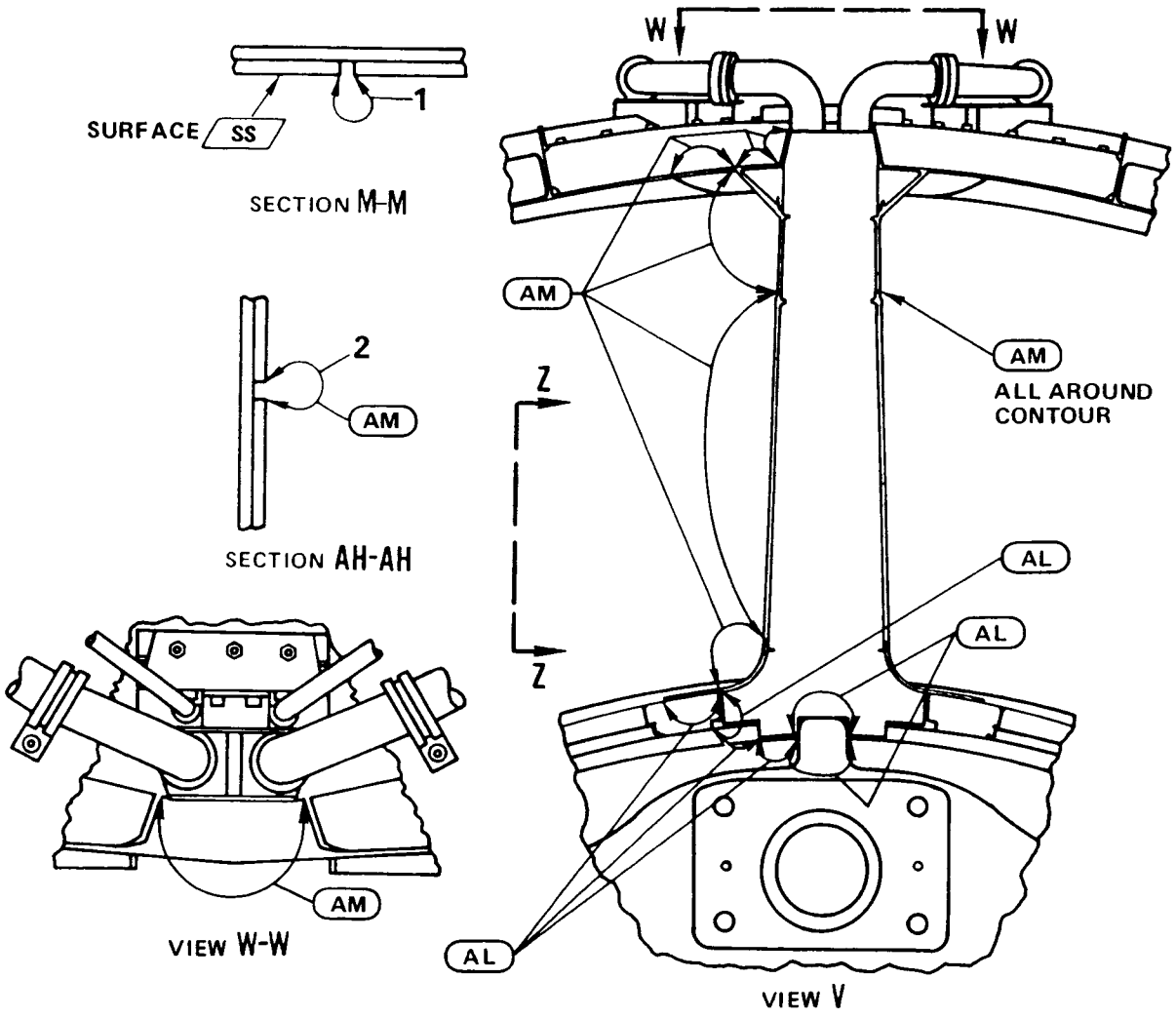
Fan Exit (Bifurcation) Fairing Assembly
(Reference 1010)
Figure 405



BM5 72 23 06 4 KJMA 01

Fan Exit (Bifurcation) Fairing Assembly Sealant Areas
(Sheet 1/3)
Figure 406



1. APPLY THE SEALANT TO MAKE A SURFACE CONTINUOUS WITH, TO 0.010 IN. (0.254 mm) ABOVE, SURFACE SS.
2. APPLY THE SEALANT TO MAKE A SURFACE CONTINUOUS WITH, TO 0.010 IN. (0.254 mm) BELOW, ALL AROUND THE ACCES COVER, TWO PLACES.

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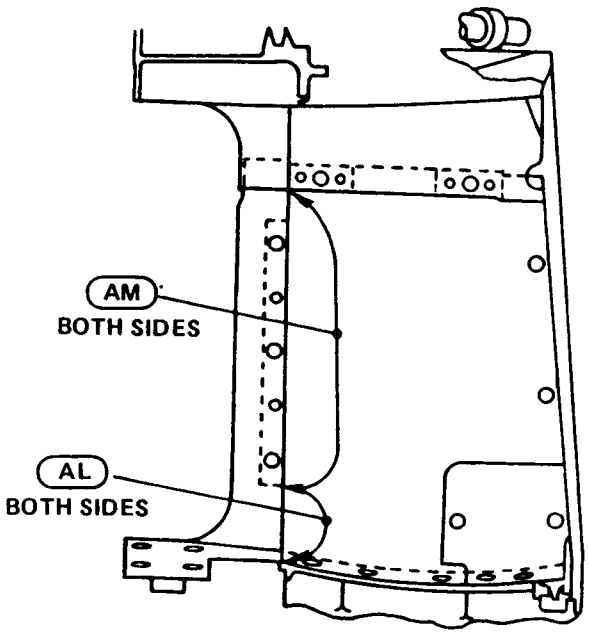
BM5 72 23 06 4 KJME - 00

Fan Exit (Bifurcation) Fairing Assembly Sealant Areas
(Sheet 2/3)
Figure 406



VIEW Z-Z

L-A7663 (0292)

BM5 72 23 06 4 KJML - 00

Fan Exit (Bifurcation) Fairing Assembly Sealant Areas
(Sheet 3/3)
Figure 406

FAN EXIT (BIFURCATION) FAIRING - INSPECTION/CHECK

1. Examine the Fan EXIT (Bifurcation) Fairing
(Ref. Fig. 601, 602)

A. Examine the fairings for the indications of damage that are shown in the tables that follow. If damage is not in the limits, replace the damaged part. To replace only the side covers (Ref. 72-23-06, P. Block 601), (steps B and C). To replace other parts, (Ref. 72-23-06, P. Block 601) (steps D and E).

(1) For removal/installation of a fairing with no rivets at the leading edge, (Ref. 72-23-08, P. Block 401).

(2) For removal/installation of a fairing with rivets all around, (Ref. 72-23-08, P. Block 401).

(3) For removal of a fairing with no rivets at the leading edge and its replacement with a fairing with rivets all around, (Ref. 72-23-08, P. Block 401).

NOTE : This inspection does not include inspection of the cover plate.

EXAMINE	REPLACE IN 50 Hours	TIGHTEN IN 50 Hours
Fairings and access covers If a part or all of the fairing is not there.	Replace the fairing	
Screws If not there	Replace the screw	
If loose		Tighten the screw
Rivets If not there or loose	Replace the rivet	
Washers If not there	Replace the washer	
Inspection for parts that are not there or that are loose Table 601		

EXAMINE	DAMAGE LIMITS		
	PERMITTED	REPLACE IN 50 HOURS	REPLACE BEFORE NEXT USE
All surfaces for : Nicks, gouges.			
Width or length	-	More than 1. (25.4)	-
Depth	-	More than 0.03 (0.762)	-
Separation (from any other damage)	-	Less than 2. (50.8)	-
Number	-	More than 5.	-
Dents (with rounded bottoms) Depth	-	More than 0.030 (0.762)	
Quantity		More than 10 percent of the surface area	
Cracks in the composite material Length	-	More than 1. (25.4)	-
Separation (from the center of an attachment rivet or screw)	-	Less than 0.5 (12.7)	-
Cracks in the vitanium of the leading edge	-	Not permitted	
Areas of broken or fuzzy stray fibers Width or length	-	1. - 2.5 (25 - 64)	More than 2.5 (63.5)
Depth	-	More than 0.03 (0.762)	-
Separation	-	Less than 2.	-

EXAMINE	DAMAGE LIMITS		
	PERMITTED	REPLACE IN 50 HOURS	REPLACE BEFORE NEXT USE
(from any other damage)		(50.8)	
Punctures, holes	-		-
Leading edge of fairing	_	-	None permitted
All other areas	_	None permitted	-
No bond of wire cloth patch Length or width	-	More than 0.5 (12.7)	
Leading edge for : Erosion (Dull or rough surface finish, fibers visible) width or length	Less than 0.500 (12.700)	More than 0.500 (12.700)	-

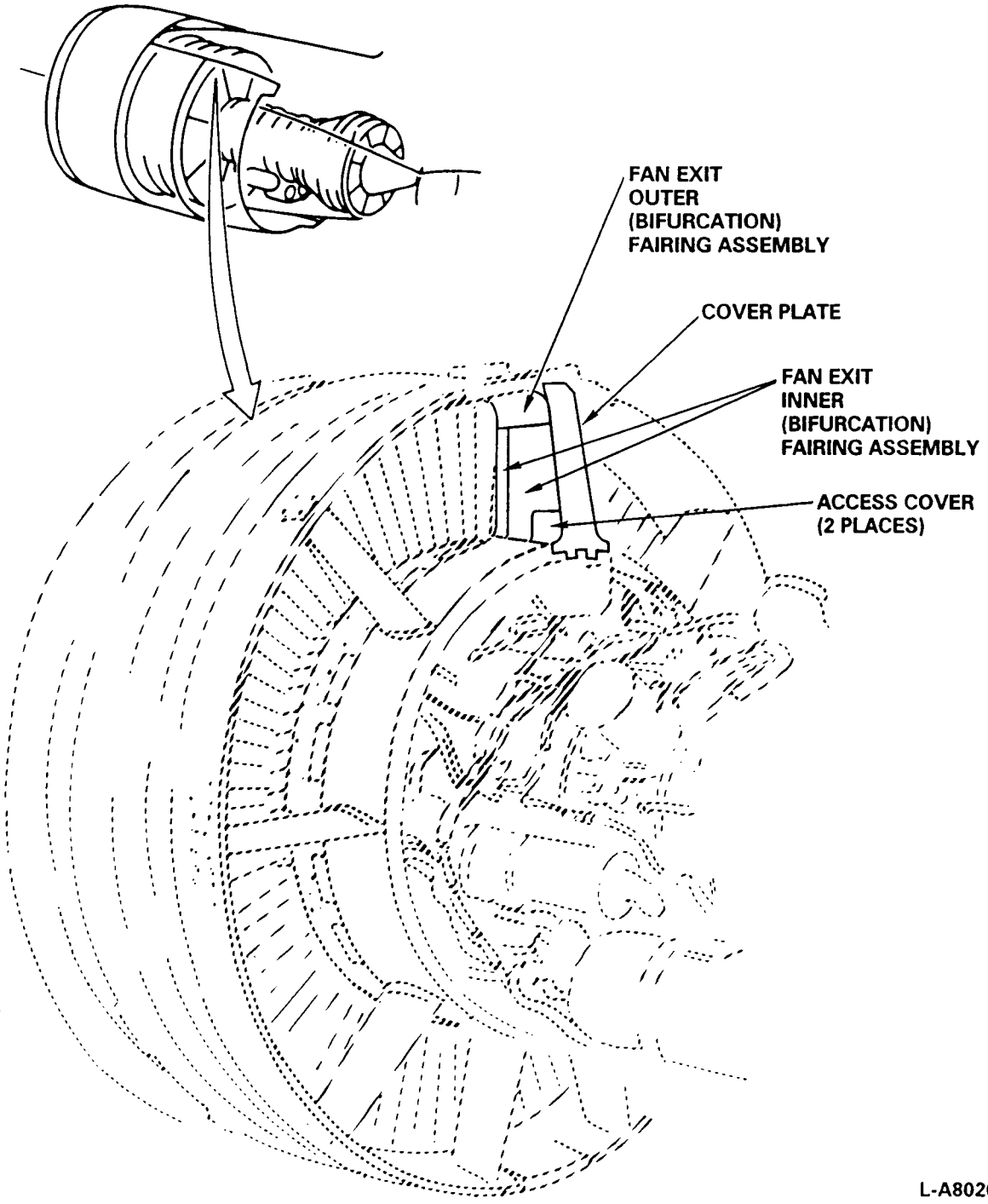
Inspection for nicks, dents, and other surface damage
Table 602

EXAMINE FOR	DAMAGE LIMITS		
	EXAMINE EVERY 50 HOURS	REPLACE IN 50 HOURS	REPLACE BEFORE NEXT USE
Delamination Width or length	Up to 1. (25.4)	1. - 2.5 (25 - 64)	More than 2.5 (63.5)
Depth	Up to 0.03 (0.762)	More than 0.03 (0.762)	-
Separation (from any other damage)	More than 2. (50.8)	Less than 2. (50.8)	-

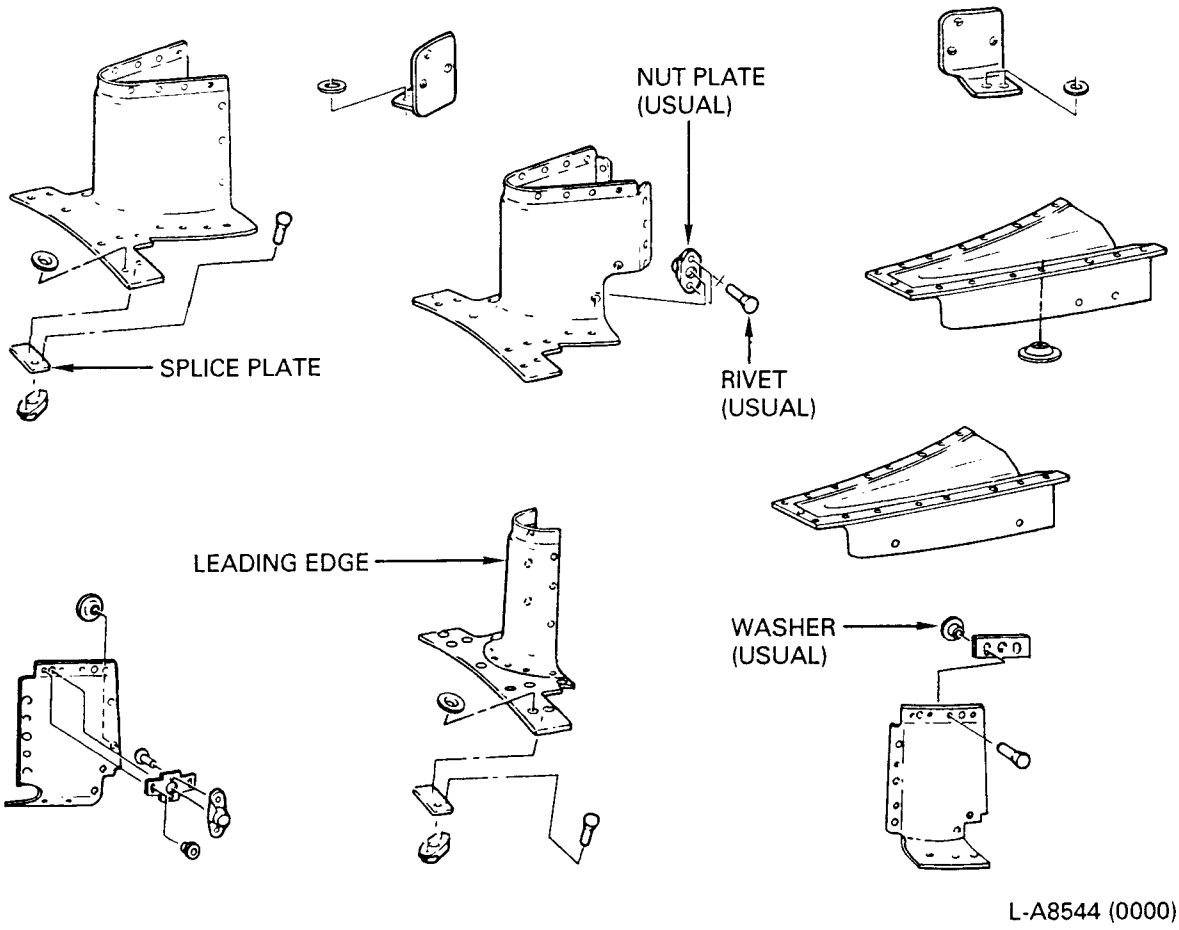
Inspection for delamination
Table 603

EXAMINE	DAMAGE LIMITS		
	REPLACE IN 50 HOURS	REPLACE IN 25 HOURS	REPLACE BEFORE NEXT USE
Leading edges for:			
Erosion Dull or rough Surface finish	Any quantity		
Fibers are visible		Any quantity	
Hole			Any quantity

Inspection for Erosion
Table 604



Location of the Fan Exit (Bifurcation) Fairings
Figure 601



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Parts of the (Bifurcation) Fairing
Figure 602

FAN EXIT (BIFURCATION) FAIRING - APPROVED REPAIRS

1. Install Boltholes in the Replacement Access Covers

A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C. Material No.P05-038	Special Materials (Ref. 70-00-00)
D. Material No.P05-152	Special Materials (Ref. 70-00-00)
E. Material No.P08-002	Bonding and Adhesive Compounds (Ref. 70-00-00)
F. Material No.P08-012	Bonding and Adhesive Compounds (Ref. 70-00-00)
G. Material No.P08-016	Bonding and Adhesive Compounds (Ref. 70-00-00)
H. Material No.P11-014	Cleaning Agents (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up

(1)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(2)Install access platform.

(3)Remove the cover plate and the damaged access cover from the 12 o'clock strut.

NOTE : Do not remove the other fairings from the 12 o'clock strut.

C. Procedure (Ref. Fig. 801)

(1)Find the positions of the new holes as follows :

(a)Attach a replacement access cover(s) and a cover plate to the inner fairing with bolts at the positions shown in the referenced figure.

(b)Mark the centerlines of all the hole diameters.

(c)Remove the previously installed workbolts.

(d)Remove the access cover and cover plate.

(2)Install the boltholes at the positions marked.

(3)Apply sealant to the machined surfaces of the cover(s) as follows :

(a)Wash the machined surfaces of the fairings and cover(s) with a solution of water and Material No.P05-152.

(b)Fully rinse the machined surfaces with clean water.

(c)Dry the machined surfaces fully in air that is at room temperature.

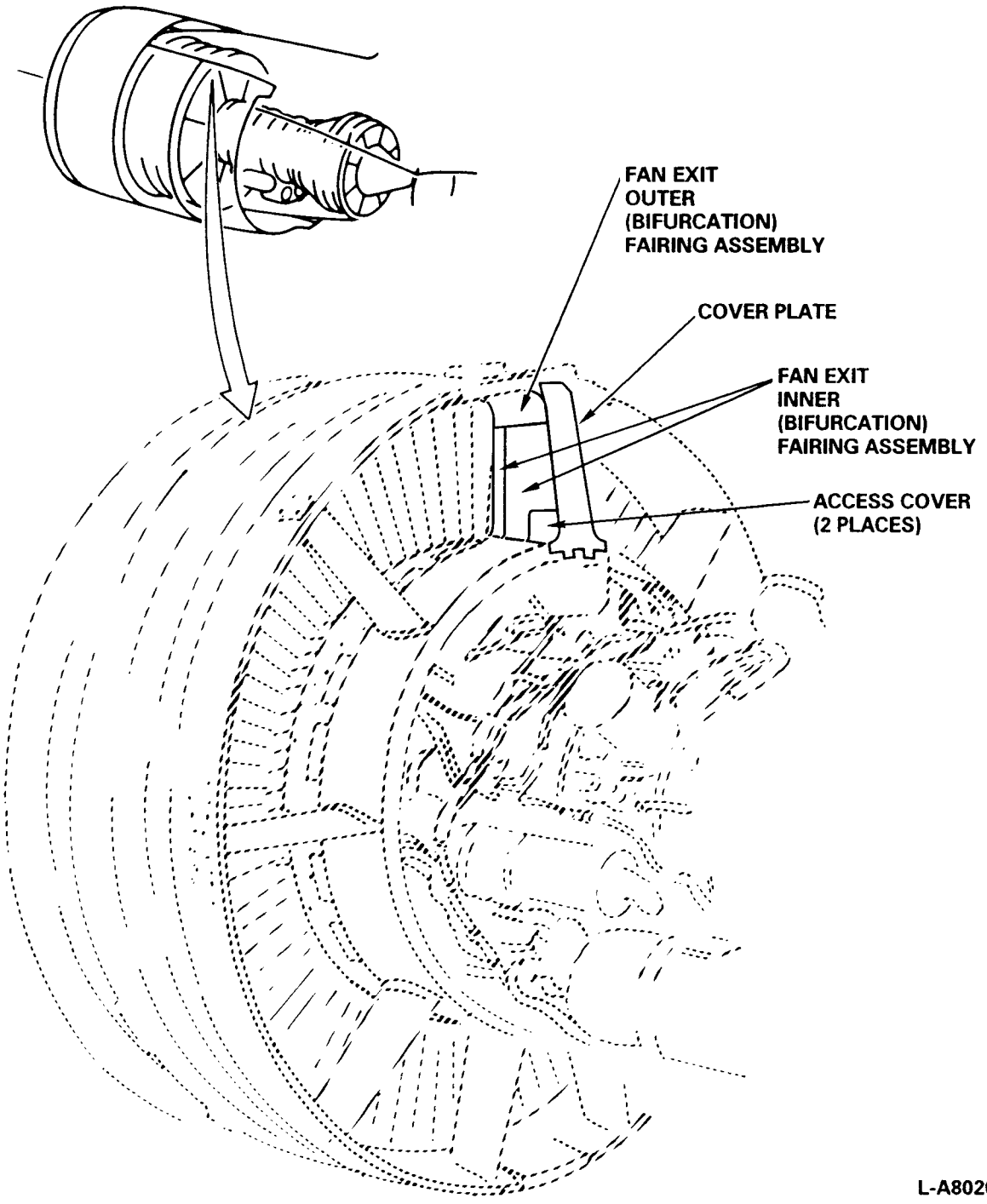
(d)Mix together, in a 4 : 1 proportion, Material No.P08-002 and Material No.P08-012. Apply the epoxy mixture to the machined surfaces. Cure the epoxy mixture at 175°F (79.4°C) for one hour, minimum.

(4)Bond washers to the boltholes.

(a)Clean the bond area of the boltholes. Use Material No.P05-038 that is wet with a SPOP 208 solvent. (Ref. 70-00-00, P. Block 201). Dry the surfaces in air that is at room temperature for a sufficient length of time to remove all traces of solvent.

(b)Clean the bond area of the washers with Material No.P11-014.

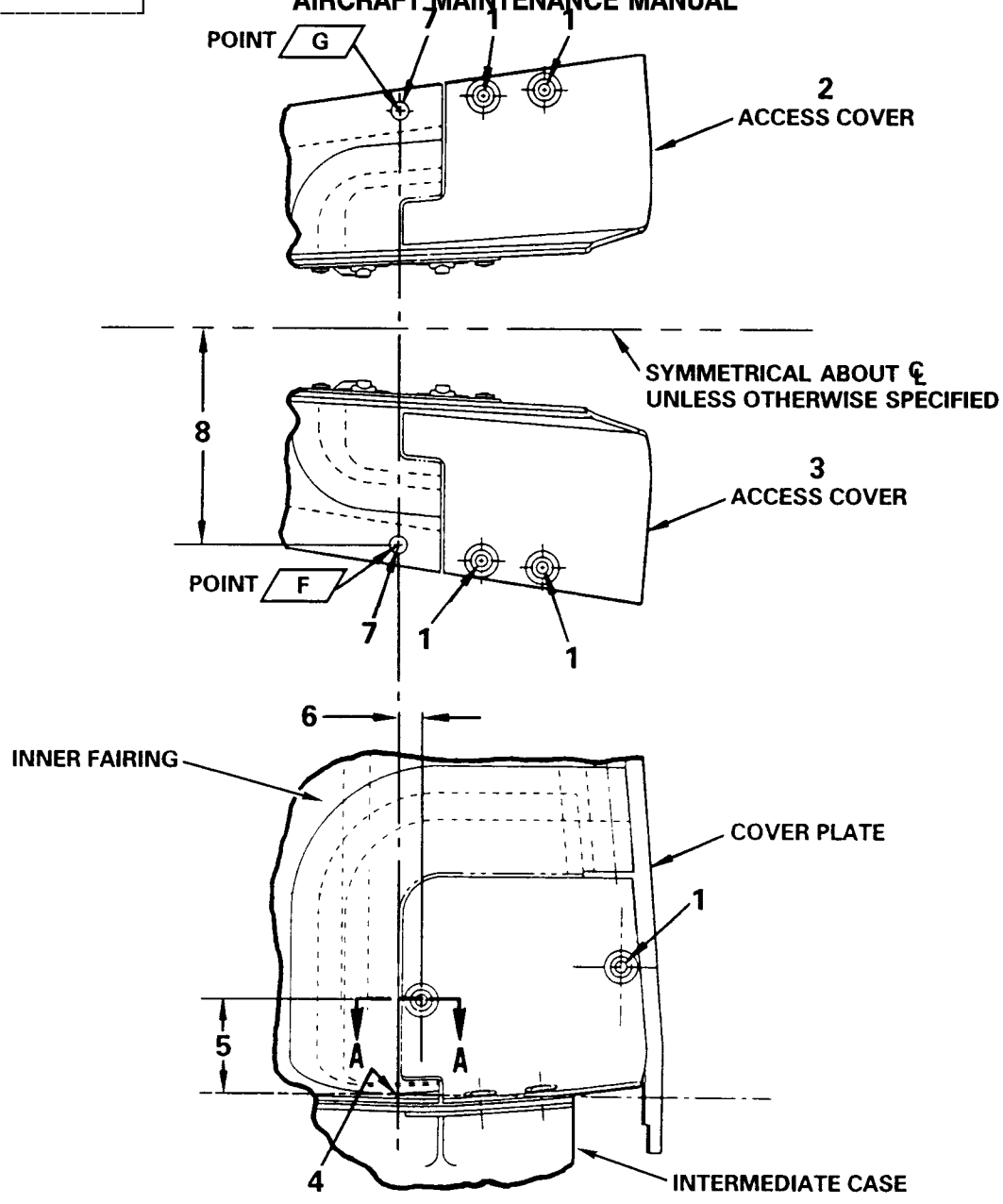
(c)Apply a constant layer of Material No.P08-016 to each bond area of the access cover(s) within 30 minutes after you cleaned it.
(d)Bond the washers to the access cover(s).
(e)cure the epoxy at room temperature for two hours, minimum.



BM5 72 23 06 8 KAMA - 00

L-A8020 (0000)

Installation of Boltholes in the
Access Covers (Sheet 1/3)
Figure 801



RIGHT SIDE VIEW
TYPICAL BOTH SIDES

1. INSTALL A WORKBOLT HERE.
2. PN 51G755-01
3. PN 51G753-01
4. POINTS F AND G
5. 1.747 IN. (44.374 mm)
6. 0.425 IN. (10.795 mm)
7. 0.327 IN. (8.306 mm) CLEARANCE ENVELOPE
8. 4.011 IN. (101.870 mm)

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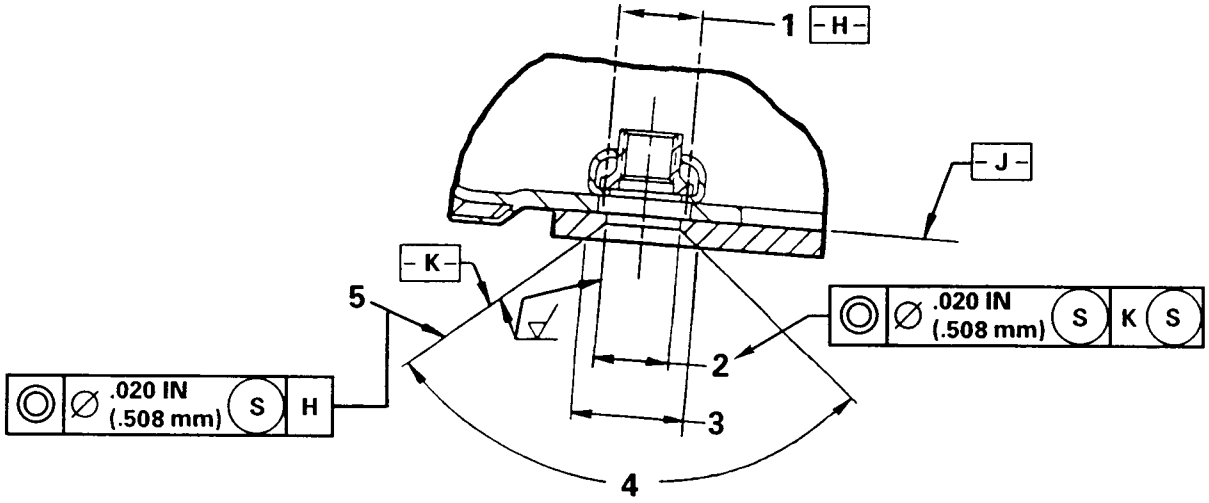
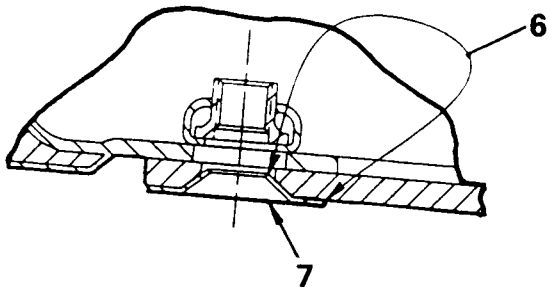
BM5 72 23 06 8 KAME - 00

Installation of Boltholes in the
Access Covers (Sheet 2/3)
Figure 801



SECTION A - A
WASHERS NOT SHOWN



SECTION A - A

1. 0.354 IN. (8.992 mm) DIAMETER CLEARANCE ENVELOPE AT SURFACE H IS RELATIVE TO SURFACE J.
2. 0.211 - 0.315 IN. (5.4 - 8.0 mm) DIAMETER. KEEP THE CLEARANCE TO THIS DIAMETER. MACHINE IF NECESSARY.
3. 0.390 - 0.410 IN. (9.91 - 10.41 mm) DIAMETER
4. 100° - 102°
5. TWO HOLES NORMAL TO SURFACE K.
6. BOND THIS AREA ALL AROUND.
7. PN NAS1169C10L WASHER, 2 PLACES

BM5 72 23 06 8 KAML - 00

L-A8022 (0000)

Installation of Boltholes in the
Access Covers (Sheet 3/3)
Figure 801

COMPRESSOR INTERMEDIATE CASE - INSPECTION/CHECK

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breakers Safety Clips
B.	Access Platform
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 72-23-07, P. Block 801	Compressor Intermediate Case
R - 75-32-00, P. Block 601	2.5 Bleed System

2. Examine the Compressor Intermediate Case

A. Job Set-Up

(1)Open, safety and tag appropriate circuit breakers and open the thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

(2)Install access platform.

B. Procedure

(1)Examine the compressor intermediate case.

(a)Refer to Table 601 (Ref. Fig. 601)

R (2)Examine the 2.5 bleed area for loose pieces of seal on the 2.5 bleed
R valve ring and the bleed duct. If you find loose pieces of seal material
R (Ref. 75-32-00, P. Block 601).

Inspect	Damage	Disposition	Repair
External skin for scratches, nicks and dents.	Any amount less than 6.00 in. (152.40 mm) maximum length and 0.012 in. (0.305 mm) maximum depth and 1.00 in. (25.40 mm) minimum separation from other similar damage.	Blend repair.	Ref. 72-23-07, P. Block 801.
Outer V Groove, for any damage :			
Area A, 11 - 1 o' clock location			
Surface damage galling	0.025 in. (0.635 mm) maximum from original surface	Blend repair damaged area smooth	Ref. 72-23-07, P. Block 801.
Raised material sharp edges		Remove raised material and	

Inspect	Damage	Disposition	Repair
		sharp edges	
Area B, 11 - 1 o'clock location			
Length	6.00 in. (152.4 mm) maximum	Blend repair	Ref. 72-23-07, P. Block 801.
Depth	0.0625 in. (1.588 mm) maximum	Blend repair	
Length:Depth ratio		10:1 Minimum for blending	
Area B, from 2:30 - 9:30 o'clock locations			
Length	1.00 in. (25.40 mm) maximum	Blend repair	Ref. 72-23-07, P. Block 801.
Depth	0.125 in. (3.175 mm) maximum	Blend repair	
Length:Depth ratio		10:1 Minimum for blending	
Area B, all other locations			
Length	0.050 in. (1.270 mm) maximum	Blend repair	Ref. 72-23-07, P. Block 801.
Depth	0.050 in. (1.270 mm) maximum	Blend repair	
Length:Depth ratio		10:1 Minimum for blending	
Minimum separation from other similar damage	1.00 in. (25.40 mm) minimum		

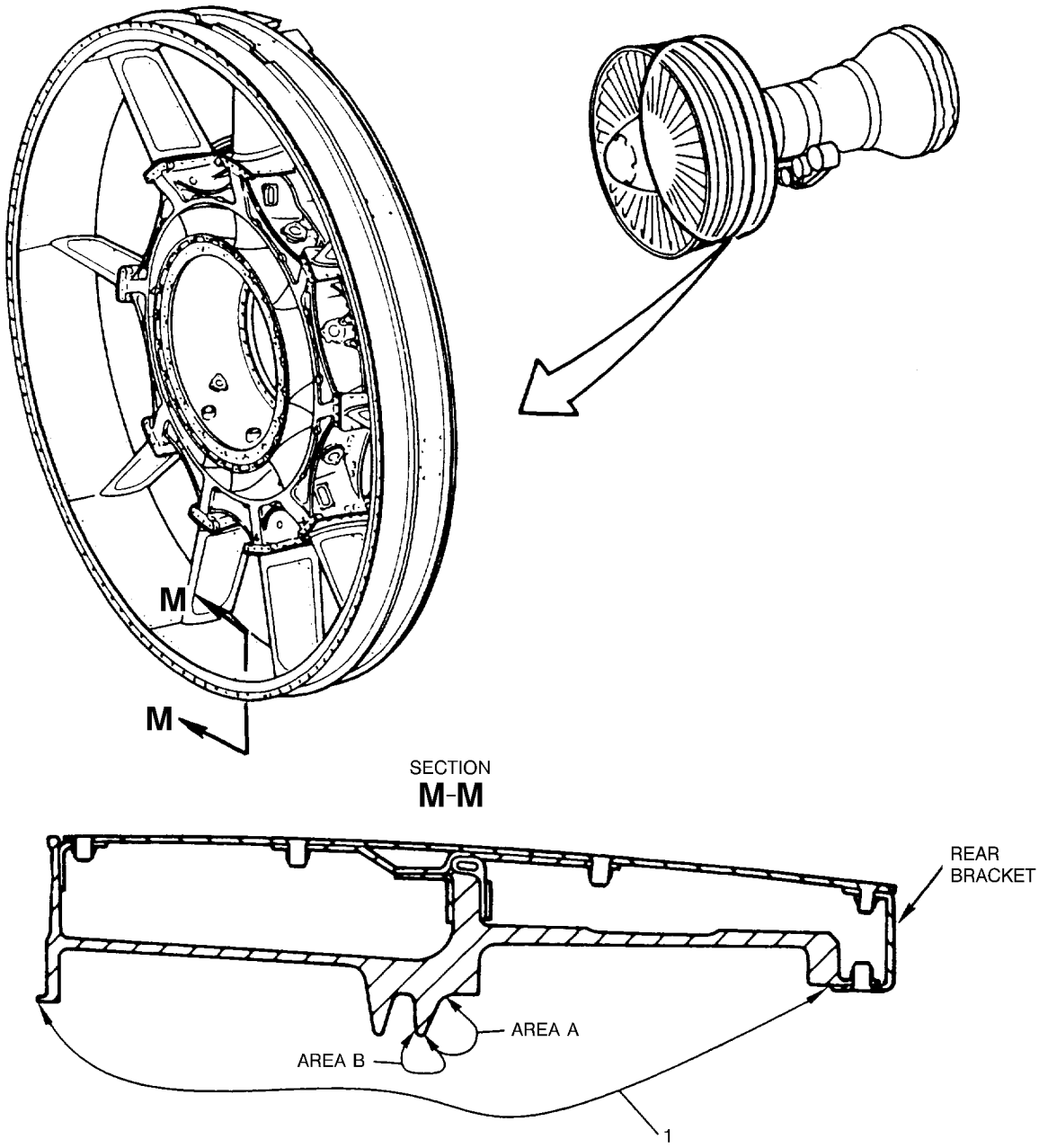
Visual Inspection
Table 601

(b)Refer to Table 602 (Ref. Fig. 602)

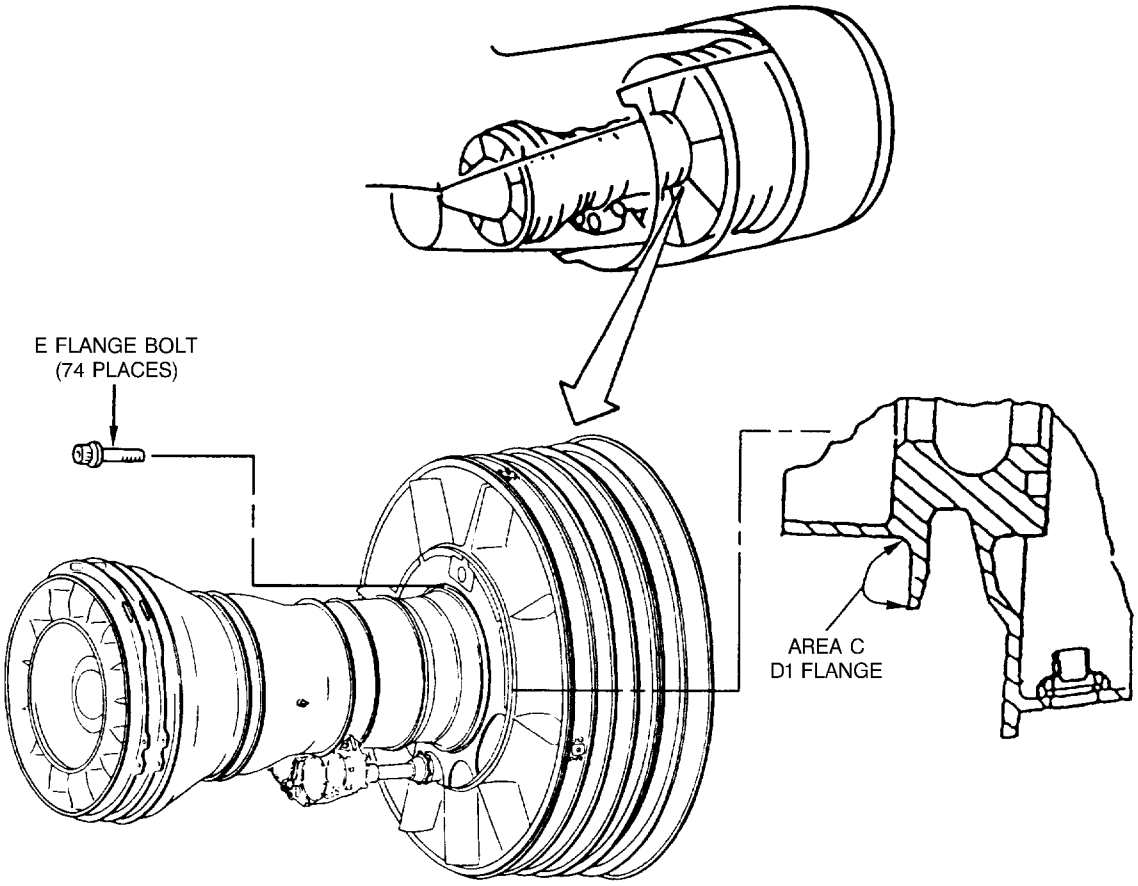
Inspect	Damage	Disposition	Repair
E flange for : bolts that are not there.	One bolt not there.	Permitted.	
	More than one bolt not there.	Remove the engine from service.	
Fan Exit Case, D1 flange assembly			
Area C, all around, for :			
Surface damage, galling	0.015 in. (0.381 mm) maximum from original surface	Blend repair damaged area smooth	Ref. 72-23-07, P. Block 801.
Raised Material sharp edges		Remove raised material and sharp edges	

Visual Inspection
Table 602

C. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close the thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



Visual Inspection of the External Skin
Figure 601



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Visual Inspection of the D1 Flange and the E Flange Bolts
Figure 602

1. Blend Repair Surface Damage - Compressor Intermediate Case External Skin

A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breakers Safety Clips
B.	Access Platform
Referenced Procedures	
- 70-00-00, P. Block 201	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag appropriate circuit breakers and open fan cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

C. Procedure
(1)Blend damage that is on the external skin of the intermediate case. Refer to Table 801 (Ref. Fig. 801)

Inspect	Serviceable Limits	Repairable Limits
External skin for : scratches, nicks and dents.		Any amount up to 6.00 in. (152.40 mm) maximum in length and up to 0.012 in. (0.305 mm) maximum in depth and 1.00 in. (25.40 mm) minimum separation from other similar damage with blend length to depth ratio of 10:1 minimum.
Outer V Groove, for : Area A, 11 - 1 o'clock location		
Surface damage galling		0.025 in. (0.635 mm) maximum from original surface - blend smooth
Raised material sharp edges	Not permitted	Blend raised material and sharp edges and make smooth
Area B, 11 - 1 o' clock location		

Inspect	Serviceable Limits	Repairable Limits
Length		6.00 in. (152.40 mm) maximum
Depth		0.0625 in. (1.588 mm) maximum
Length:Depth ratio		10:1 Minimum for blending
Area B, from 2:30 - 9:30 o'clock locations		
Length		1.00 in. (25.40 mm) maximum
Depth		0.125 in. (3.175 mm) maximum
Length:Depth ratio		10:1 Minimum for blending
Area B, all other locations		
Length		0.050 in. (1.270 mm) maximum
Depth		0.050 in. (1.270 mm) maximum
Length:Depth ratio		10:1 Minimum for blending
Minimum separation from other similar damage		1.00 in. (25.40 mm) minimum
Fan Exit Case, D1 flange assembly		
Area C, all around, for :		
Surface damage, galling		0.015 in. (0.381 mm) depth maximum from original surface - blend smooth
Raised Material sharp edges	Not permitted	Blend raised material and sharp edges and make smooth

Repair Limits
Table 801

(a)Blends for damage below the handling pads at 3 o'clock and 9 o'clock positions can not extend into fillet radius.
(b)Surface polish can extend into the fillet radius.
(2)Apply anodize touch-up to the blended areas by SPOP 42 (Ref. 70-00-00, P. Block 201).

D. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close the fan cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

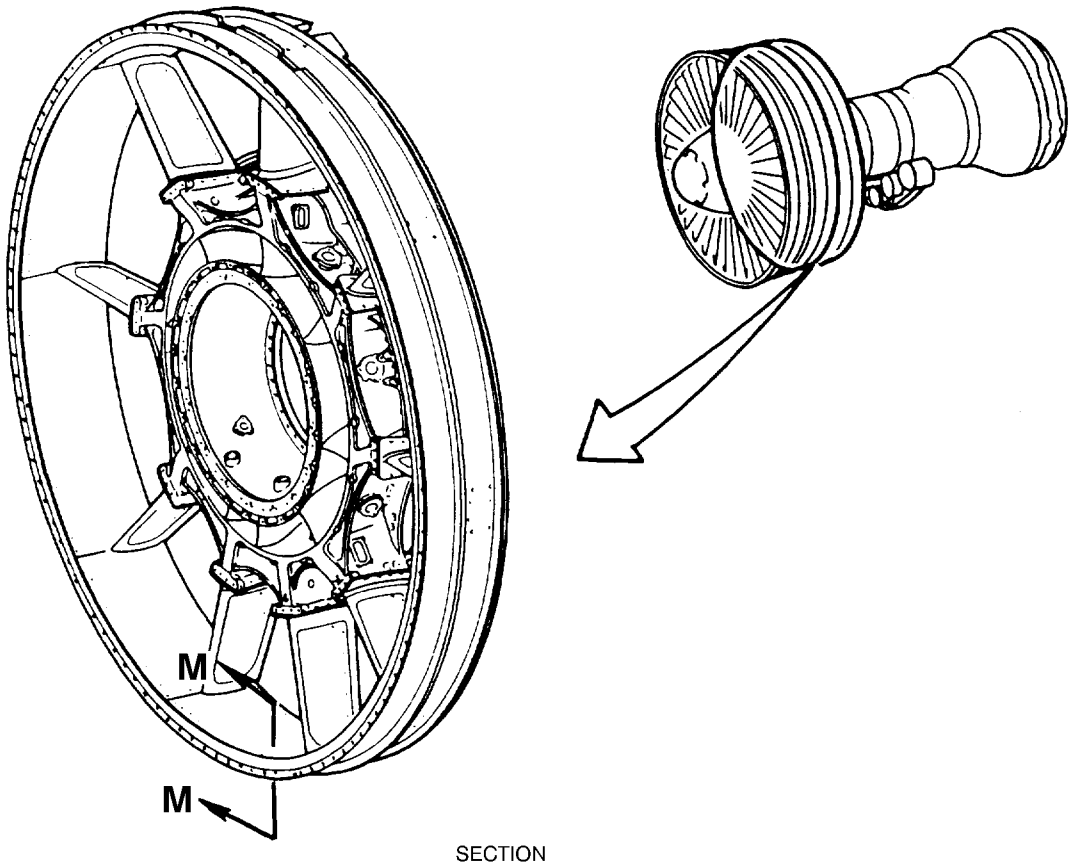
2. Replace Fan Exit Case Mid Flange Bracket Assemblies - Compressor Intermediate Case

A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breakers Safety Clips
B.	Rivet
C. Material No.P05-038	Special Materials (Ref. 70-00-00)
D. Material No.P05-104	Special Materials (Ref. 70-00-00)
E. Material No.P09-027	Sealant (Ref. 70-00-00)
F. Material No.P18-003	Primer (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-13-00, P. Block 301	Cowl Doors
- 72-23-05, P. Block 401	Fan Exit Liner Segments

B. Job Set-Up
(1)Open, safety and tag appropriate circuit breakers and open fan cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove the applicable fan exit liner segments (outer) (Ref. 72-23-05, P. Block 401).

C. Procedure
(Ref. Fig. 802)
(1)Remove the damaged bracket assembly from the intermediate case mid flange.
(a)Machine the rivets that attach the bracket assembly to the intermediate case mid flange.
(b)Push out the rivets with the correct size drift.
(c)Remove the bracket assembly and if installed, the seal plate.
(2)Inspect the seals for any damage. If the seal is damaged in any way, replace it. Additional bracket assemblies need to be removed per step (1) to have full access to the seal.
(a)Remove the seal as follows :
1 Remove seal in large pieces using pliers. Be careful not to damage the intermediate case or adjacent seals.



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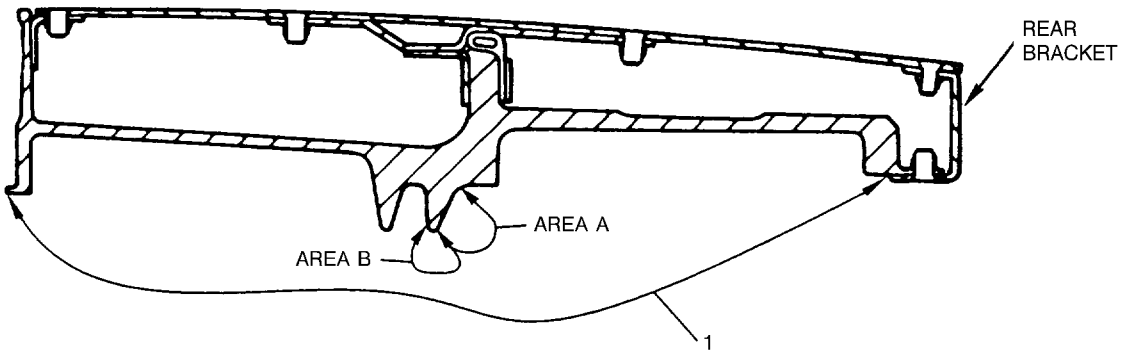
M-M



1 - EXTERNAL SKIN AREA TO BE BLENDED.
ALSO AREA A AND AREA B ON D FLANGE TO BE BLENDED.

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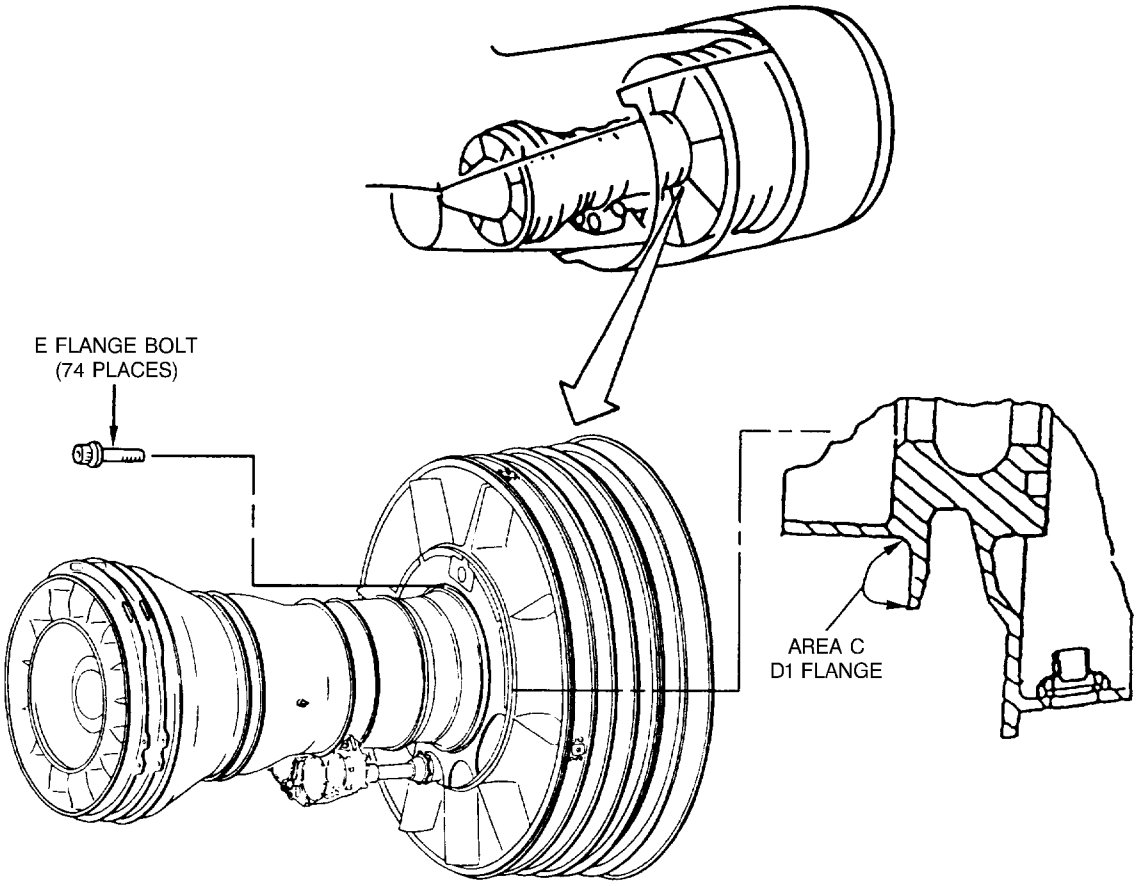
Blend Repair Surface Damage -
Compressor Intermediate Case (Sheet 1)
Figure 801



AREA C ON D1 FLANGE TO BE BLENDED

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Blend Repair Surface Damage -
Compressor Intermediate Case (Sheet 2)
Figure 801

2 Remove any old sealant from the intermediate case with a nylon scraper.
3 (Post SB PW4ENG 72-195 and Pre SB PW4ENG 72-519) On engines without seal plates, use emery cloth (Material No.P05-104) to remove old residue of adhesive and sealant and to get a good bonding surface.

(3)(Post SB PW4ENG 72-195 and Pre SB PW4ENG 72-519) On engines with seal plates, inspect the seal plate. If the seal plate is damaged in any way, replace it. Additional bracket assemblies will need to be removed per step (1) to have full access to the seal plate.
(4)Prepare the replacement bracket assembly.
(a)Attach the bracket assembly to the intermediate case mid flange with clamps.
(b)Transfer drill the rivet holes from the intermediate case mid flange to the new bracket assembly.
(c)Remove the bracket assembly from the intermediate case mid flange.
(d)(Post SB PW4ENG 72-195 and Pre SB PW4ENG 72-519) On engines with seal plates, do this if seal plate is being replaced.
1 Install the seal plate in position on the intermediate case mid flange using clamps.
2 Transfer drill the rivet holes from the intermediate case mid flange to the new seal plate.
3 Remove the seal plate from the intermediate case mid flange.
(e)Remove any burrs from the rivet holes.
(5)Touch up surface treatment per SPOP 42 on any bare aluminum areas (Ref. 70-00-00, P. Block 201).
(6)Touch up surface treatment per SPOP 208. Allow to dry completely (Ref. 70-00-00, P. Block 201).
(7)Apply silicone rubber sealant (Material No.P09-027) to the mid flange. Allow sealant to become tacky.
(8)(Post SB PW4ENG 72-195 and Pre SB PW4ENG 72-519) Engines with seal plates.
(a)Install seal, bracket assembly, and seal plate on to the intermediate case mid flange.
(b)Apply primer (Material No.P18-003) to the rivets.
(c)Install rivets while primer is wet.
(d)Use the cold upset procedure to install the rivets.
(e)Inspect installed rivets for cracks, clearance and correct seating. Replace rivets as required.
(9)(Pre SB PW4ENG 72-195 and Post SB PW4ENG 72-519) Engines without seal plates.
(a)Install the bracket assembly on the intermediate case mid flange.
(b)Apply primer (Material No.P18-003) to the rivets.
(c)Install rivets while primer is wet.
(d)Use the cold upset procedure to install the rivets.
(e)Inspect installed rivets for cracks, clearance, and proper seating. Replace rivets as required.
(f)Cut the seal to required length.
(g)Clean the mid flange area where sealant will be applied.
(h)Clean the bonding area on the seal.
(j)Abrade the bonding surface of the seal and then clean the bonding area again.

(k)Apply a bead of silicone rubber sealant (Material No.P09-027) to the case mid flange. Remove excess sealant with cheesecloth (Material No.P05-038).

(l)Install the seal into the gap between the intermediate case mid flange and the bracket assembly. Hold in place with spring clamps for 30 minutes.

(10)Clean the areas around the rivet, bracket assemblies and seal plates (if installed) where sealant will be applied per SPOP 208. Allow to dry (Ref. 70-00-00, P. Block 201).

(11)Apply silicone rubber sealant (Material No.P09-027) in the gaps between the bracket assemblies, seals, rubber tube, and the case struts.

NOTE : Silicone rubber sealant (Material No.P09-027) can replace the rubber tube seal if desired.

NOTE : The rubber tube fits into the gap between the seals.

(12)Remove any extra sealant with cheesecloth (Material No.P05-038).

(13)Cure at room temperature. Allow 8 hours with no contact. Allow 24 hours minimum total cure time.

NOTE : Humidity of less than 25% with extend cure time.

(14)Make sure the fan exit case seals are installed correctly and have not delaminated from the intermediate case mid flange and bracket assemblies.

D. Close-Up

(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)Install the fan exit liner segments (outer) (Ref. 72-23-05, P. Block 401).

NOTE : Installation of the liner panels cannot be accomplished until the 24 hour minimum total cure time has elapsed.

(3)Close the fan cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

3. Replace Rear Fan Exit Case Bracket - Compressor Intermediate Case

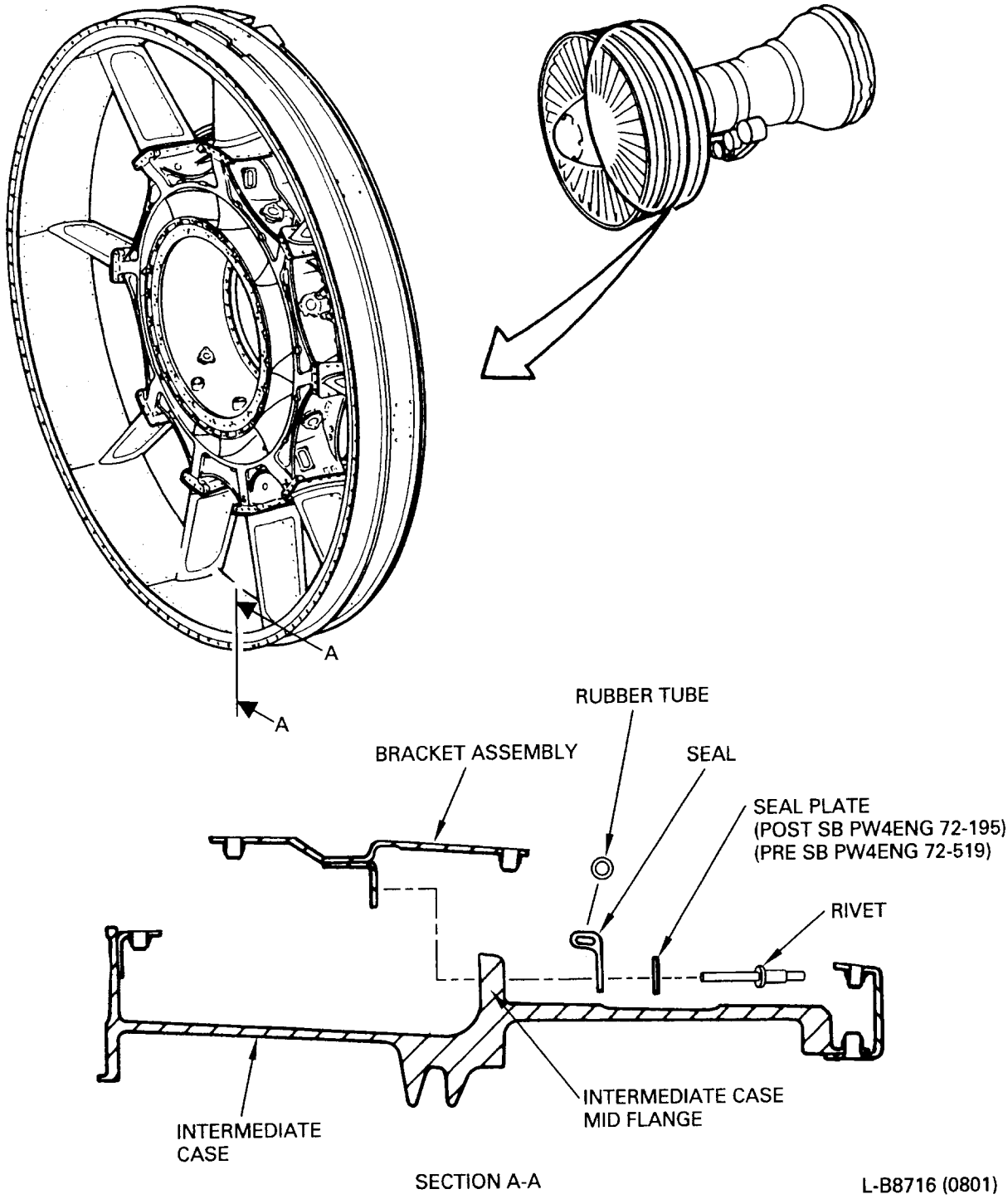
A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breakers Safety Clips
B.	Rivet
C. Material No.P05-038	Special Materials (Ref. 70-00-00)
D. Material No.P09-014	Sealant (Ref. 70-00-00)
E. Material No.P09-027	Sealant (Ref. 70-00-00)
F. Material No.P18-003	Primer (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 72-23-05, P. Block 401	Fan Exit Liner Segments

B. Job Set-Up

(1)Open, safety and tag appropriate circuit breakers and open fan cowl doors (Ref. 71-13-00, P. Block 301).

(2)Remove the fan exit liner segments (outer) (Ref. 72-23-05, P. Block 401).



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Installation of Mid Flange Fan Exit Case Bracket
Figure 802

C. Procedure

Refer to table 802 (Ref. Fig. 803)
Refer to table 803 (Ref. Fig. 804)

(1)Remove the bracket assembly.
  (a)Machine the rivets that attach the bracket assembly to the intermediate case.
  (b)Push out the rivets with the correct drift.
  (c)Remove the bracket assembly.
(2)Remove any old sealant from the bracket assembly and the mating surface of the intermediate case with a nylon scraper.
(3)Install the bracket assembly.
  (a)Attach the bracket assembly to the intermediate case mid flange with clamps.
  (b)Transfer drill the rivet holes from the intermediate case to the new bracket assembly.
  (c)Remove the bracket from the intermediate case.
  (d)Remove any burrs from the rivet holes.
  (e)Install the rivets.
    1 Prime the rivets with primer (Material No.P18-003).
    2 Install the rivets while the primer is wet.
    3 Use the cold upset procedure to upset the rivets.
  (f)Inspect the rivets for cracks, clearance, and proper seating.
  (g)Clean around the rivet holes.
  (h)Apply sealant (Material No.P09-014) or sealant (Material No.P09-027) to the rivet.
  (j)Remove excess sealant with cheesecloth (Material No.P05-038).
  (k)Cure sealant at room temperature at a minimum relative humidity of 25%. Allow drying time until sealant is no longer tacky and for two hours minimum before touching.

Key to figure (Ref. Fig. 803)

ITEM	DESIGNATION
1.	Rivet, 98 places.
2.	Bracket Assembly.
3.	Rivet Stem must be flush to below surface P. If necessary machine the Stem.
4.	Apply sealant here. The sealant must be continuous with, to 0.010 in. (0.254 mm) all around.
5.	0.100 in. (2.540 mm) all around.
6.	Sealant is optional and can be incomplete in this area.
7.	0.245 - 0.255 in. (6.22 - 6.48 mm)
8.	1.650 - 1.680 in. (41.91 - 42.67 mm).
9.	Within a diameter equal to twice the diameter of the manufactured head. It is allowable for the maximum gap between faying surfaces to be 0.005 in. (0.127 mm).
10.	Thirteen Rivets equally spaced over arc CZ, six places.
11.	Ten Rivets equally spaced over arc DA, two places.
12.	0.143 - 0.146 in. (3.633 - 3.708 mm) diameter. Make a chamfer to 100 degrees with a clearance of 0 degrees 30 minutes. It is permitted for the countersink to go into the case.

ITEM	DESIGNATION
13.	Flush to 0.030 in. (0.762 mm) below. Including the Stem.

Table 802

Key to figure (Ref. Fig. 804)

ITEM	DESIGNATION
1.	0.045 - 0.075 in. (1.14 - 1.90 mm), two places.
2.	Bracket Assembly. Ref. PPIPC for PN.
3.	305 degrees 10 minutes
4.	Bracket Assembly. Ref. PPIPC for PN.
5.	260 degrees 31 minutes
6.	Bracket Assembly. Ref. PPIPC for PN.
7.	Bracket Assembly. Ref. PPIPC for PN.
8.	215 degrees 30 seconds
9.	180 degrees
10.	Bracket Assembly. Ref. PPIPC for PN.
11.	144 degrees 30 minutes
12.	Bracket Assembly. Ref. PPIPC for PN.
13.	99 degrees 29 minutes
14.	Bracket Assembly. Ref. PPIPC for PN.
15.	54 degrees 33 minutes
16.	Bracket Assembly. Ref. PPIPC for PN.
17.	11 degrees 35 minutes 49 seconds, two places.
18.	0.280 in. (7.112 mm), 16 places.
19.	0.100 - 0.140 in. (2.54 - 3.54 mm), seven places.

Table 803

D. Close-Up
(1) Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2) Install the fan exit liner segments (outer) (Ref. 72-23-05, P. Block 401).
(3) Close the fan cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

4. Replace Baffles - Compressor Intermediate Case

A. Equipment and Materials

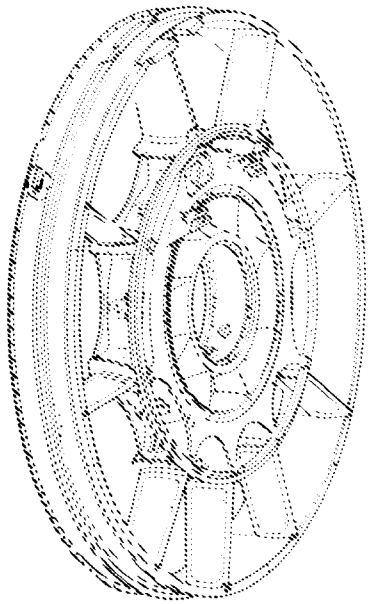
ITEM	DESIGNATION
A.	Circuit Breakers Safety Clips
B.	Baffle
D. Material No.P09-027	Sealant (Ref. 70-00-00)
E. Material No.P11-065	Cleaning Agents (Ref. 70-00-00)
E. Material No.P11-014A	Cleaning Agents (Ref. 70-00-00)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors

ITEM	DESIGNATION
- 72-23-05, P. Block 401	Fan Exit Liner Segments

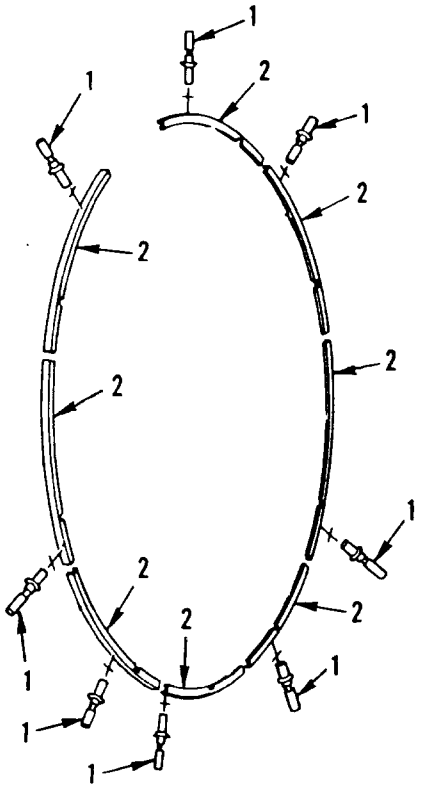
B. Job Set-Up
(1)Open, safety and tag appropriate circuit breakers and open fan cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove the applicable fan exit case inner segment assembly(s) (Ref. 72-23-05, P. Block 401).

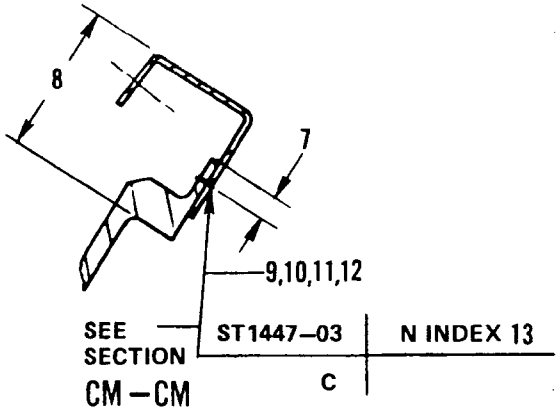
C. Procedure
(Ref. Fig. 805)
(1)Remove the baffles as follows :
(a)Cut the sealant that is between the baffles.
(b)Remove the baffle. Be careful not to damage the other baffles with the tab of the baffle that you remove.
(2)Remove any remaining sealant with a nylon scraper.
(3)Install the baffle in the forward empty space of the intermediate case.
NOTE : If you replace all of the baffles, start at a 6 o'clock and continue in both directions.
(a)The single tab must be toward the rear of the intermediate case.
(b)Be careful not to break the tab while you try to put the baffle under the bracket.
(c)Use a 0.130 - 0.150 in. (3.30 - 3.81 mm) diameter pin between the baffle to get the correct fit.
NOTE : If you replace the baffles at 11 and 1 o'clock, cut them so that they fit under the brackets that are details of the intermediate case liner segments.
(4)Remove the new baffles.
(5)Clean the mating ends of the baffles with acetone (Material No.P11-065) or isopropyl alcohol (Material No.P11-014A). Allow to dry.
(6)Apply silicone rubber sealant (Material No.P09-027) to one or both adjacent ends of baffles. The sealant must be thick enough to fill the space between the baffles.
NOTE : Make sure that no part of the mating end of the baffle is without sealant. There must be no empty spaces in the sealant.
(7)Install the baffle(s) while the sealant is wet. Make sure that there is a 0.130 - 0.150 in. (3.30 - 3.81 mm) space between the baffles.
(8)Cure the sealant at room temperature at 25% relative humidity for two hours before handling.

D. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Install the liner segment assembly (Ref. 72-23-05, P. Block 401).
(3)Close the fan cowl doors and remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

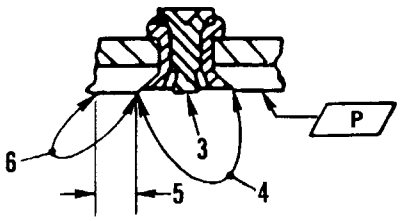


INTERMEDIATE CASE ASSEMBLY





SECTION CB-CB



SECTION CM-CM

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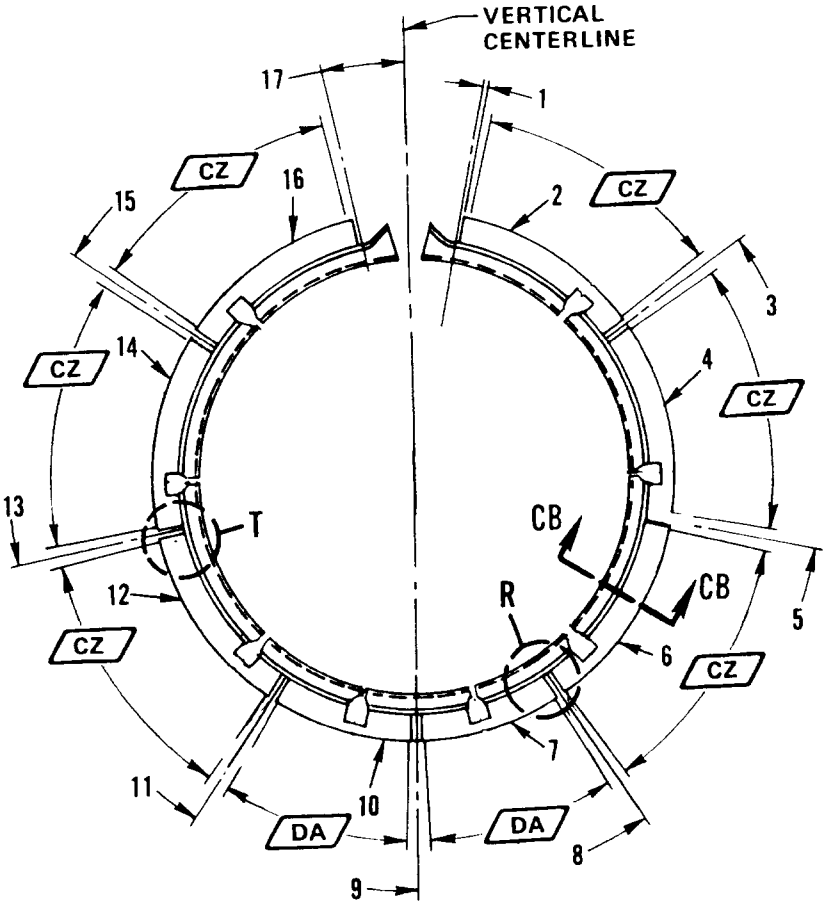
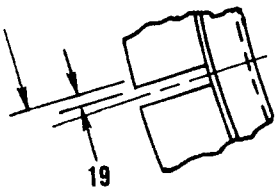
Rear Fan Exit Case Bracket Removal (Sheet 1/2)
Figure 803



SCHEMATIC REAR VIEW



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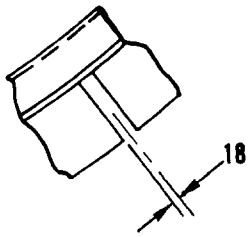

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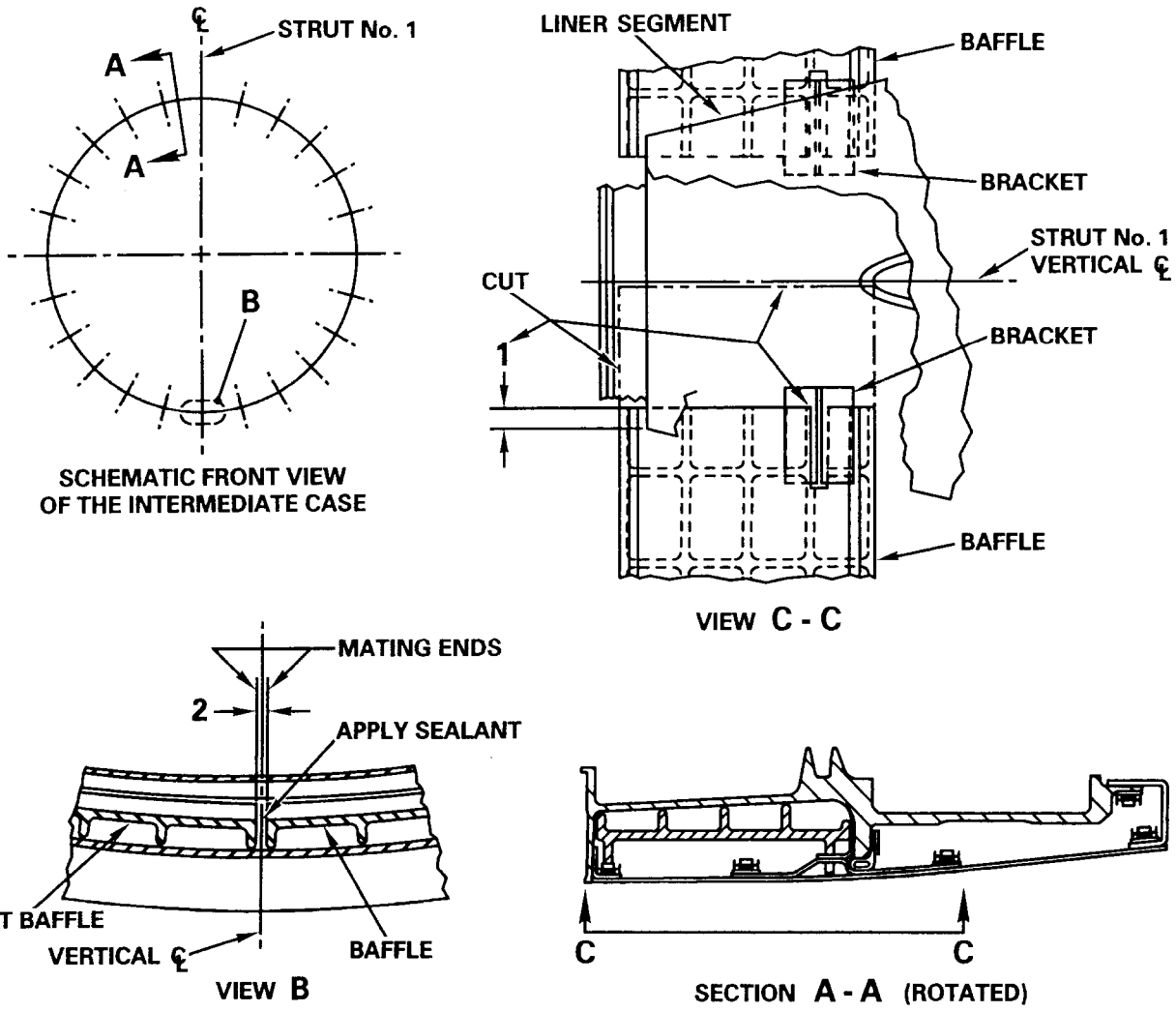
Rear Fan Exit Case Bracket Removal (Sheet 2/2)
Figure 804



1. 0.500 in. (12.700 mm) MINIMUM
2. 0.130 - 0.150 in. (3.30 - 3.81 mm), 23 PLACES.

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Replace Baffles
Figure 805

COMPRESSOR INTERMEDIATE CASE FAIRING - INSPECTION/CHECK

R 1. Equipment and Materials

R ITEM	DESIGNATION
R A.	Circuit Breakers Safety Clips
R B.	Access Platform
R Referenced Procedure R - 71-13-00, P. Block 301	Cowl Doors

R 2. Job Set-Up

R A. Open, safety and tag appropriate circuit breakers and open the thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

R B. Install access platform.

R 3. Examine the Compressor Intermediate Case Fairing (Ref. Fig. 601)

A. Examine the fairings for the indications of damage that are shown in the tables that follow.
(1)For removal/installation of a fairing with no rivets at the leading edge (Ref. 72-23-08, P. Block 801).
(2)For removal/installation of a fairing with rivets all around (Ref. 72-23-08, P. Block 801).
(3)For removal of a fairing with no rivets at the leading edge and its replacement with a fairing with rivets all around, (Ref. 72-23-08, P. Block 801).

Examine	Repair Before Next Flight	Replace In 50 or 100 Hours
Fairings for :		
R If all of the fairing is not there		100
R If part of the fairing is not there		50
R Looseness at the leading edge		50
Rivets for :		
R If not there		100
R If loose		100

Inspection For Parts That Are Not There Or That Are Loose
Table 601

Examine	Damage Limits: Permitted	Damage Limits: Replace In 50 Hours In. (mm)	Damage Limits: Replace Before Next Use In. (mm)
All surfaces for : Nicks, gouges			
Width or length of damage	-	More than 1 (25.4)	-
Depth of damage	-	More than 0.03 (0.762)	-
Separation (from any other damage)	-	Less than 2 (50.8)	-
Quantity of incidents	-	More than 5	-
Dents (with rounded bottoms)			
Depth of damage	-	More than 0.030 (0.762)	-
Total area of damage	-	More than 10 percent of the surface area	-
Cracks Length of damage	-	More than 1 (25.4)	-
Separation (from the center of an attachment screw)	-	Less than 0.5 (12.7)	-
Areas of broken or fuzzy stray fibers width or length of damage	-	1.000 - 2.5 (25 - 64)	More than 2.5 (63.5)
Depth of damage	-	More than 0.03 (0.762)	-
Separation (from any other damage)	-	Less than 2. (50.8)	-
Tears, holes,			

Examine	Damage Limits: Permitted	Damage Limits: Replace In 50 Hours In. (mm)	Damage Limits: Replace Before Next Use In. (mm)
punctures in the wire mesh indentations See NOTE			
Total area of damage	10 percent of the surface, maximum	More than 10 percent of the surface	-
Area of an incident of damage	Damage that does not extend beyond the individual indentation	Damage that extends beyond the individual indentation	-
No bond of wire cloth patch length or width of damage	-	More than 0.500 (12.700)	-
Leading edge for : Erosion (Dull or rough surface finish, fibers visible)			
Width or length of damage	less than 0.500 (12.700)	More than 0.500 (12.700)	-
No bond of wire cloth patch length or width	-	More than 0.5 (12.7)	-

Inspection For Nicks, Dents, And
Other Surface Damage
Table 602

NOTE : The indentations in the surface of the fairing are formed by the wire mesh screen underneath the surface material.

Examine for	Damage Limits: Examine Every 50 Hours In. (mm)	Damage Limits: Replace In 50 Hours In. (mm)	Damage Limits: Replace Before Next Use In. (mm)
Delaminations Width or Length of damage	Up to 1 (25.4)	1 - 2.5 (25 - 64)	More than 2.5 (63.5)
Depth of damage	Up to 0.03 (0.0762)	More than 0.03 (0.762)	-
Separation (from any other damage)	More than 2 (50.8)	Less than 2 (50.8)	-

Inspection For Delamination
Table 603

R 4. Examine the Compressor Intermediate Case E Flange Bolts (Ref. Fig. 602)

Inspect	Damage	Disposition	Repair
E Flange for :			
Bolts that are not there	- One bolt not there	Permitted	
	- More than one bolt not there	Remove the engine from service	

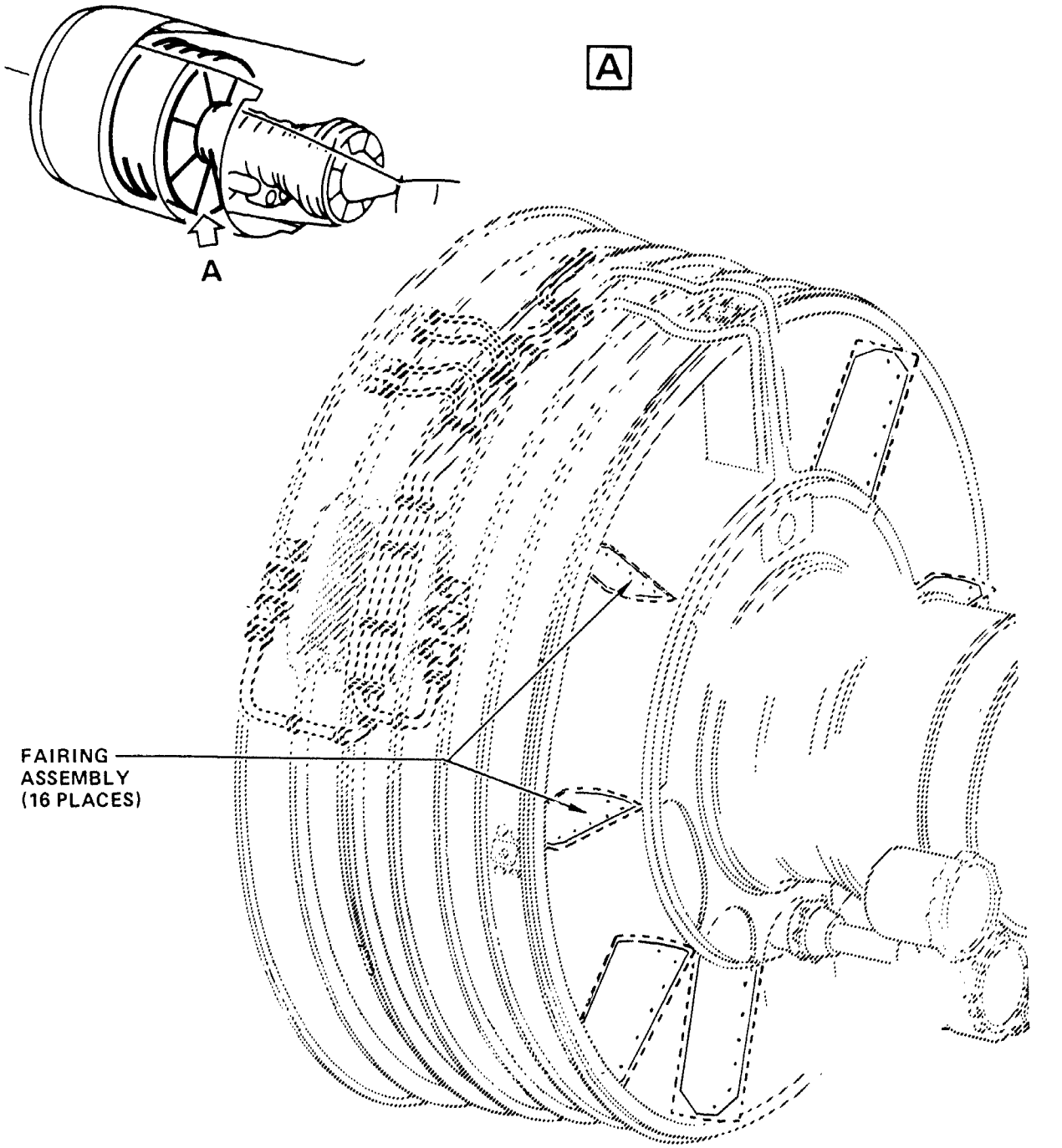
Visual Inspection
Table 604

R 5. Close up

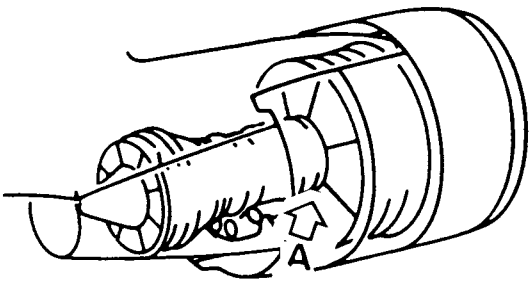
R A. Make certain that working area is clean and clear of tools and
R miscellaneous items of equipment.

R B. Remove access platform.

R C. Close the thrust reverser and fan cowl doors, remove safety clips and
R tags and close circuit breakers (Ref. 71-13-00, P. Block 301).



Location of the Compressor Intermediate
Case Fairing Assembly.
Figure 601



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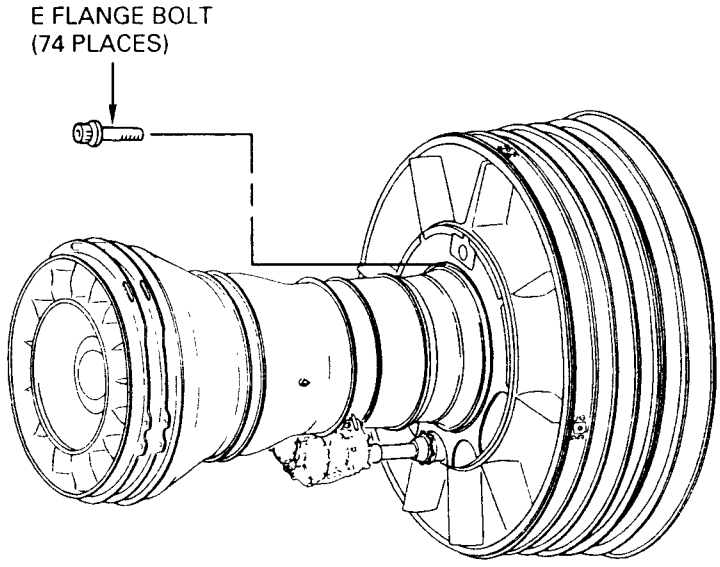

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Compressor Intermediate Case E Flange Bolts
Figure 602

COMPRESSOR INTERMEDIATE CASE FAIRINGS - APPROVED REPAIRS

1. Replace a Fairing with no Rivets at the Leading Edge

NOTE : Use this procedure if you replace a fairing with no rivets at the leading edge with the same type of fairing.

A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C. Material No.P05-038	Special Materials (Ref. 70-00-00)
D. Material No.P05-155	Special Materials (Ref. 70-00-00)
E. Material No.P05-203	Special Materials (Ref. 70-00-00)
F. Material No.P09-014	Sealants (Ref. 70-00-00)
G. Material No.P09-027	Sealants (Ref. 70-00-00)
H. Material No.P18-003	Primer (Ref. 70-00-00)
J.	Rivet, Blind
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up

(1)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

(2)Install access platform.

C. Procedure (Ref. Fig. 801)

(1)Machine out the rivets of the fairing.

(2)Do not make the diameters of the rivet holes greater than 0.143 in. (3.363 mm) diameter.

(3)Cut the sealant at the edges of the fairing.

CAUTION : DO NOT USE A TOOL TO LIFT THE FAIRING FROM THE STRUT. TO USE A TOOL CAN CAUSE THE FAIRING TO DELAMINATE.

(4)Remove the fairing.

CAUTION : DO NOT DAMAGE THE PARENT MATERIAL WHEN YOU REMOVE EXISTING SEALANT.

(5)Mechanically remove any damaged or unbonded sealant from the bonding surfaces of the fairing and the intermediate case assembly.

(6)If you install new fairings transfer drill the rivet holes from the strut into the fairing.

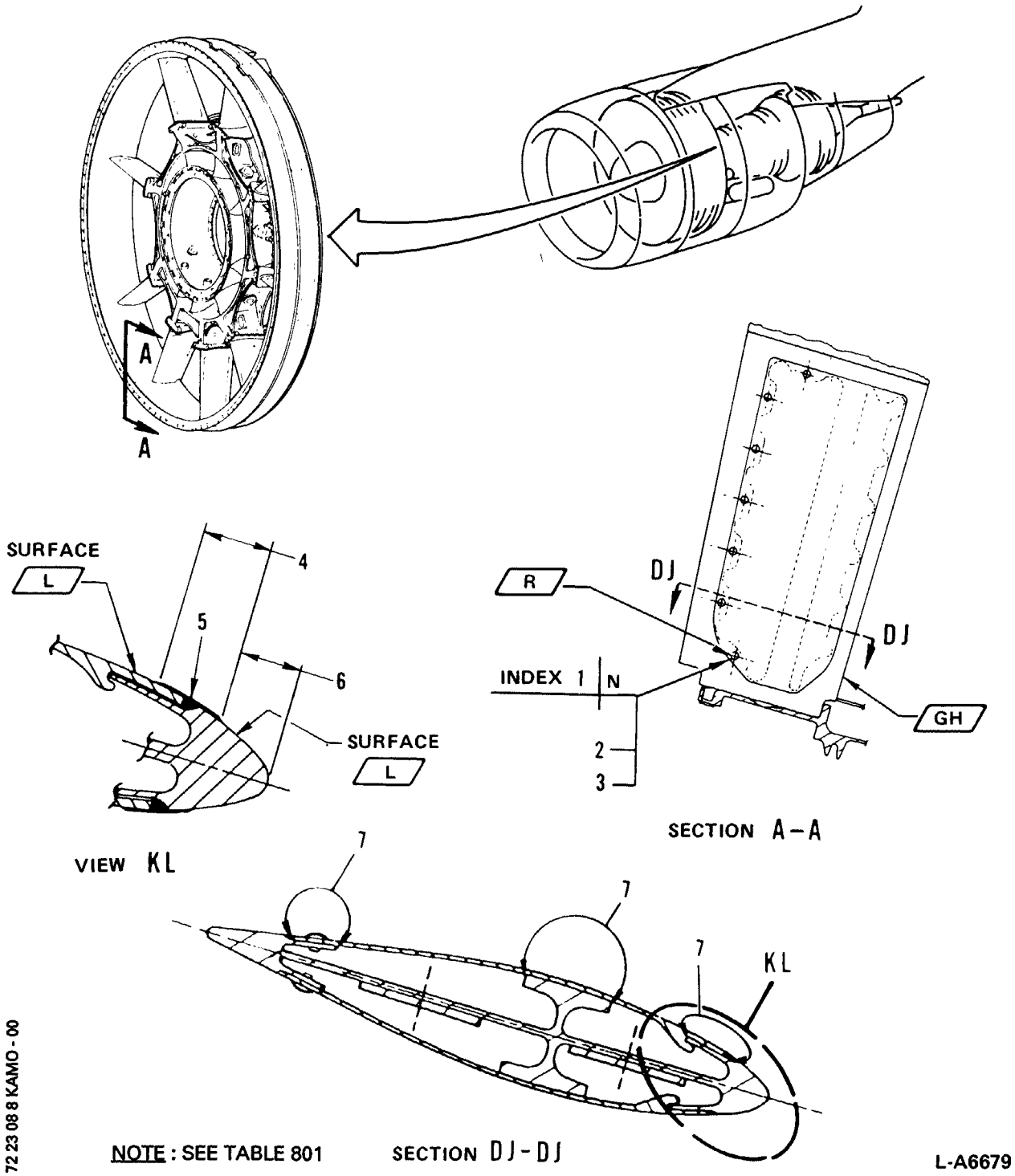
(7)Clean the parts of the strut, fairing, and intermediate case that the sealant will touch.

(a)Make wet a piece of clean Material No.P05-038 with a SPOP 208 solvent (Ref. 70-00-00, P. Block 201).

(b)Wipe the repair area with the cheesecloth.

(c)Dry the surfaces fully in air that is at room temperature.

(d)If you do not apply sealant immediately, cover the cleaned parts



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Fairing Replacement
Figure 801

with Material No.P05-155 or P05-203. You must apply the sealant in two hours.
(8)Apply either sealant Material No.P09-014 or Material No.P09-027 to the mating surface of the strut.
(9)Attach the fairing to the strut with clamps.
(10)Apply Material No.P18-003 to the rivets. Rivet the fairing to the strut. Inspect the rivets for cracks, clearance, and correct seating.
(11)Fill the gaps and edges with either sealant Material No.P09-014 or Material No.P09-027.
(a)Remove unwanted sealant with Material No.P05-038.
(b)Cure the sealant :
1 At room temperature.
2 In air that has a relative humidity of 25 percent, minimum.
3 Until it is no longer tacky and for two hours, minimum, before you touch it. If possible, cure the sealant for eight hours, total, before operation of the engine.

D. Fairing Replacement Designation Table (Ref. Fig. 801)

ITEM	DESIGNATION
1.	Rivet, 7 places. Use existing hole in panel to locate machined rivet hole.
2.	0.128 - 0.132 in. (3.25 - 3.35 mm) diameter through the strut wall, both sides.
3.	Within a diameter equal to twice the manufactured head diameter, it is allowable for the maximum gap between faying surfaces to be 0.005 in. (0.127 mm).
4.	0.50 in. (12.70 mm) maximum.
5.	The sealant must be flush to 0.015 in. (0.381 mm) above surface L, all around, both sides.
6.	0.300 in. (7.620 mm) minimum, along surface GH only.
7.	Bond all around, both sides.

Table 801

E. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close thrust reverser and fan cowl doors, remove safety clips and tag and close circuit breakers (Ref. 71-13-00, P. Block 301).

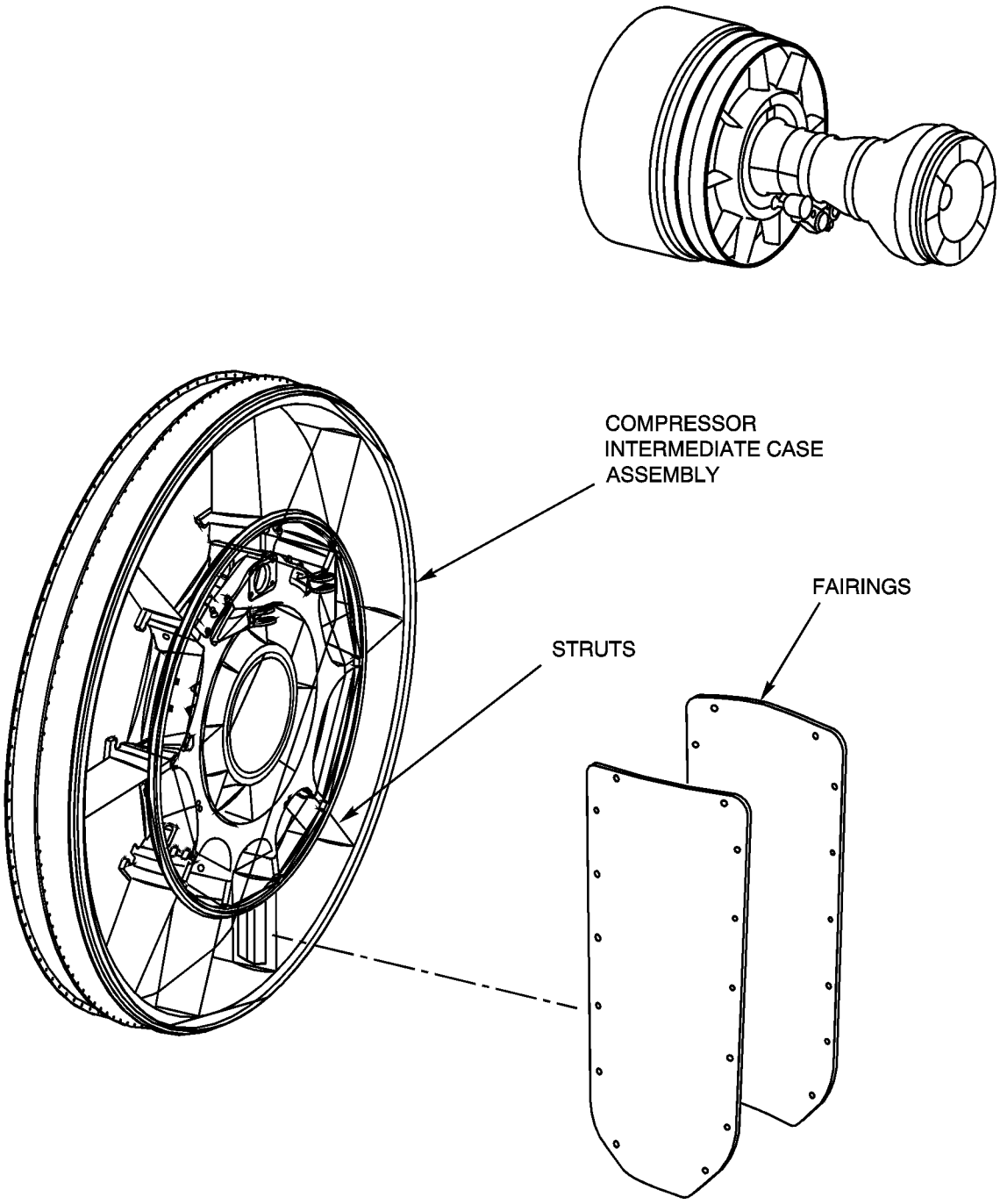
2. Replace a Fairing with Rivets all Around
NOTE : Use this procedure if you replace a fairing that has rivets all around.

A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
C. Material No.P05-038	Special Materials (Ref. 70-00-00)
D. Material No.P05-155	Special Materials (Ref. 70-00-00)
R E. Material No.P05-289	Special Materials (Ref. 70-00-00)
R F. Material No.P05-421	Special Materials (Ref. 70-00-00)
R G. Material No.P09-014	Sealants (Ref. 70-00-00)
R H. Material No.P09-027	Sealants (Ref. 70-00-00)
R I. Material No.P18-003	Primer (Ref. 70-00-00)
J.	Rivet, Blind
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

C. Procedure
R (1)Gain access to the intermediate case strut fairings (Ref. Fig. 802).
R CAUTION : DO NOT DRILL INTO THE FAIRING TO CAUSE ENLARGED HOLES OR ANY DAMAGE TO THE FAIRING.
R (2)Locate the 14 rivets that attach the fairing to the strut and with a 0.125 in. (3.175 mm) drill bit, carefully machine rivet holes to remove the rivet.
R (3)With a 0.125 in. (3.175 mm) diameter punch, carefully remove the shank of the rivets. The rivet shanks will be collected later in this procedure.
R NOTE : It is recommended an angled blade type tool be made for aluminum fairing removal. An angled blade may be made from a 1.0 in. (25.400 mm) wide putty knife or equivalent. Modify the tool as shown (Ref. Fig. 803) to reduce the risk of damage to the aluminum fairing during removal. You can also apply cloth or plastic tape to the angled edge to keep damage to the fairing at a minimum.
R (4)Carefuly raise one edge of the fairing along the perimeter to cut the strut to fairing adhesive bond with the angled tool. Move the tool around the entire perimeter to cut the bond. You can tap the tool with a small hammer in difficult areas.
R CAUTION : DO NOT APPLY TOO MUCH FORCE THAT CAN PERMANENTLY DISTORT THE FAIRING WHEN LIFTING THE FAIRING FROM THE STRUT.
R (5)Gently raise the fairing to release the bond at the strut center rib. If the fairing does not loosen, raise the edge, use a long plastic or wooden tool to cut the bond, or insert a thin safety wire (Material No.P05-289) with sufficient length, under the fairing. With handles, pull the wire to cut the adhesive (Ref. Fig. 804).
R (6)As each fairing is removed, mark the fairing and strut location so the fairings can be installed again in the original strut location.



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Location of Compressor Intermediate Case Strut Fairings
Figure 802

R

R NOTE : The manufacturing assembly procedure allows fairing rivet hole patterns to be different between struts.

(7) Find and remove all punched out rivet shanks.

CAUTION : REMOVE ALL OF THE SILICONE ADHESIVE FROM THE STRUTS AND FAIRINGS. IMPROPER BONDING WILL OCCUR AND INSTALLATIION WILL NOT BE SUCCESSFUL UNLESS ALL OF THE OLD SILICONE ADHESIVE IS REMOVED.

(8) Clean the fairings and strut areas to remove all of the old silicone adhesive. No traces of the old silicone adhesive are to remain. Remove large pieces or thick areas with a plastic or hard wooden scraper. Wooden scrapers machined to a sharp edge work well. Metal scrapers must not be used. Final silicone adhesive removal can be done by any mechanical method that will not damage the fairing or strut area. A non-agressive rotary Scotch Brite Pad (Material No.P05-421) or bristle brush can be used for the removal of the old silicone adhesive on the struts and aluminum fairings. Use rotary brushes with care to avoid damage to the aluminum fairing.

CAUTION : BE SURE ALL OLD RIVETS AND SILICONE ADHESIVE MATERIAL DEBRIS IS COLLECTED AND DISCARED. DEBRIS CAN CAUSE DAMAGE TO THE ENGINE.

(9) Remove all old rivet pieces and silicone adhesive material debris and properly discard.

(10) Inspect the fairings and strut areas for damage from use of removal tools and silicone adhesive removal methods. Minor scratches in the aluminum fairing less than 0.020 in. (0.508 mm) should be made smooth with no raised material and treated by SPOP 42 (Ref 70-00-00, P.Block 201). All areas where a rotary tool was used must be treated by SPOP 42 (Ref. 70-00-00, P.Block 201) regardless of condition. Replace any damaged fairings.

(11) Inspect the strut rivet holes as follows :

(a) For composite fairings

The strut rivet holes must be 0.128 - 0.132 in. (3.252 - 3.352 mm) diameter (Ref. Fig. 805). If holes are enlarged, drill an alternate rivet hole. See step (13).

(b) For aluminum fairings

The strut rivet holes must be 0.128 - 0.132 in. (3.252 - 3.352 mm) diameter. If any of the strut rivet holes are enlarged in the nine locations other than Location "A" shown in (Ref. Fig. 806) machine the holes to 0.143 - 0.146 in. (3.633 - 3.708 mm) diameter or 0.160 - 0.164 in. (4.064 - 4.165 mm) diameter to meet the requirements for oversized rivets provided.

If strut rivet holes are enlarged more than 0.132 in. (3.352 mm) diameter in the five places, Location "A" shown in (Ref. Fig. 806), or if any other rivet hole is more than 0.164 in. (4.165 mm) diameter, do the alternate rivet hole repair. See Step (13).

NOTE : Enlargement of the strut rivet holes may require that you enlarge the fairing rivet holes to the same size as the strut rivet holes.

(12) When installing a used aluminum fairing, inspect the fairing rivet holes for enlargement. The diameter of the holes can not be more than 0.164 in. (4.165 mm).

R NOTE : Rivet holes on certain aluminum fairings may be as small as
R 0.128 in. (3.252 mm) diameter.
R (13)If necessary, do an alternate rivet hole repair as follows:
R (a)Find the best location for an alternate rivet hole. The alternate rivet
R hole must be 0.125 in. (3.175 mm) minimum away from the edge of the
R enlarged hole or the edge of the strut tab. If the hole cannot be
R installed to the minimum limit provided, contact Pratt & Whitney
R Customer Technical Service for assistance.
R (b)Drill alternate rivet holes in the strut, 0.128 - 0.132 in.
R (3.252 - 3.352 mm) diameter.
R (c)Mark and transfer drill the alternate rivet holes from the strut to the
R fairing. The alternate hole in the fairing must be 0.125 in. (3.175 mm)
R minimum from the edge of the enlarged hole or the edge of the fairing.
R If the hole cannot be installed to the minimum limit provided, contact
R Pratt & Whitney Customer Technical Service for assistance or use a new
R fairing.
R CAUTION : FAILURE TO FULLY CLEAN THE CONTACT SURFACES WILL RESULT IN A
R POOR BOND OR BOND FAILURE.
R (14)Clean the strut and fairing areas that the silicone adhesive will contact
R by SPOP 208 (Ref. 70-00-00, P.Block 201). Allow the cleaned areas to dry
R completely. If fairings will not be installed in 30 minutes or less,
R cover the cleaned parts with paper (Material No.P05-155). Dust and
R fingerprints can prevent correct bonding of the mating surfaces. Apply
R silicone adhesive in two hours or less. If more than two hours have
R elapsed, do the clean process again.
R (15)Apply silicone adhesive (Material No.P09-014 or P09-027) completely to
R the perimeter area of the strut and tabs to a minimum of 0.100 in.
R (2.540 mm) thickness. Sufficient thickness is required to let the
R adhesive squeeze out when the fairing is installed (Ref. Fig. 807)
R (View "B").
R (16)Apply silicone adhesive (Material No.P09-014 or P09-027) completely to
R the strut center rib area (Ref. Fig. 807) (View "C"). Apply the adhesive
R in two rows to the full length of the center rib on the edges. There must
R be no voids in the rows of silicone. The rows must be separated and the
R silicone adhesive must join with the silicone adhesive applied to the
R perimeter.
R CAUTION : APPLY THE FAIRING TO THE SILICONE ADHESIVE IN FIVE MINUTES OR
R LESS. PARTIAL CURING OF THE SILICONE CAN OCCUR AFTER FIVE
R MINUTES AND PREVENT CORRECT BONDING.
R (17)Immediately install the correct fairing to the silicone adhesive. Press
R firmly to be sure there is full contact.
R (18)Install a Cleco fastener in each corner and in the center of the leading
R and trailing edge.
R (19)Install three spring clamps on each leading edge and trailing edge. The
R clamp force must be 25.0 lbf (111.2 N) at each clamp (Ref. Fig. 806).
R (20)Apply wet primer (Material No.P18-003) to the rivets.
R (a)(Ref. Fig. 806) for correct rivet locations. Install the rivets in a
R cross pattern. Remove Cleco fasteners as necessary. This will make sure
R there is correct bond of the silicone adhesive.
R (b)Install rivets as follows:
R For Composite Fairings:

R Install 14 rivets, PN 51G122.
R For Aluminum Fairings, use one of the methods shown:
R 1 Pre SB PW4G-100-72-204 part numbers, install 14 rivets, PN 51G122, unless oversize rivets are necessary.
R 2 Install (5) rivets, PN 51G122 in Location A, trailing edge only (Ref. Fig. 806). New rivets, PN ST1173-02 or PN ST1173-03 must be installed in nine holes as long as holes measure 0.128 - 0.132 in. (3.3 - 3.4 mm). Holes that measure 0.143 - 0.146 in. (3.633 - 3.708 mm), install rivet, PN ST1174-02 or PN ST1174-03. For holes that measure 0.160 - 0.164 in. (4.064 - 4.165 mm), install rivet, PN ST1215-02 or ST1215-03.
R NOTE : Do not install rivets, PN ST1173-02 or PN ST1173-03 in Location A (Ref. Fig. 808). They will not fit.
R (21)Do not remove the clamps until all the rivets have been installed.
R (22)Remove unwanted silicone adhesive with a clean cheesecloth (Material No.P05-038).
R CAUTION : TO MAKE SURE THE PARTS ARE BONDED CORRECTLY, BE SURE TO SEAL THE TRAILING EDGE RIVETS AND FAIRING PERIMETER NO MORE THAN TWO HOURS AFTER THE RIVETING OPERATION. IF IT IS MORE THAN TWO HOURS HAVE ELAPSED AFTER RIVETING, THE AREA MUST BE CLEANED AGAIN BEFORE THE SEALANT IS APPLIED.
R (23)Apply silicone adhesive (Material No.P09-014 or P09-027) to seal the perimeter of the fairing (Ref. Fig. 808).
R (24)Apply silicone adhesive (Material No.P09-014 or P09-027) to seal the rivet stem holes of rivets PN 51G122 (Ref. Fig. 808) (Section D-D).
R NOTE : Rivets PN ST1173-02, PN ST1173-03, PN ST1174-02, PN ST1174-03, PN ST1215-02 or PN ST1215-03 do not need to be sealed.
R (25)If an alternate rivet hole has been drilled in the fairing, apply silicone adhesive (Material No.P09-014 or P09-027) to seal the enlarged rivet holes.
R (26)Removed all rivet pieces and silicone adhesive material debris must be properly discarded.
R (27)Let the silicone adhesive cure for 24 hours at room temperature in air that has a relative humidity of 25 percent minimum.

R D. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

3. Replace a Fairing with no Rivets at the Leading Edge
NOTE : Use this procedure to replace a fairing with no rivets at the leading edge with a fairing that has rivets all around.

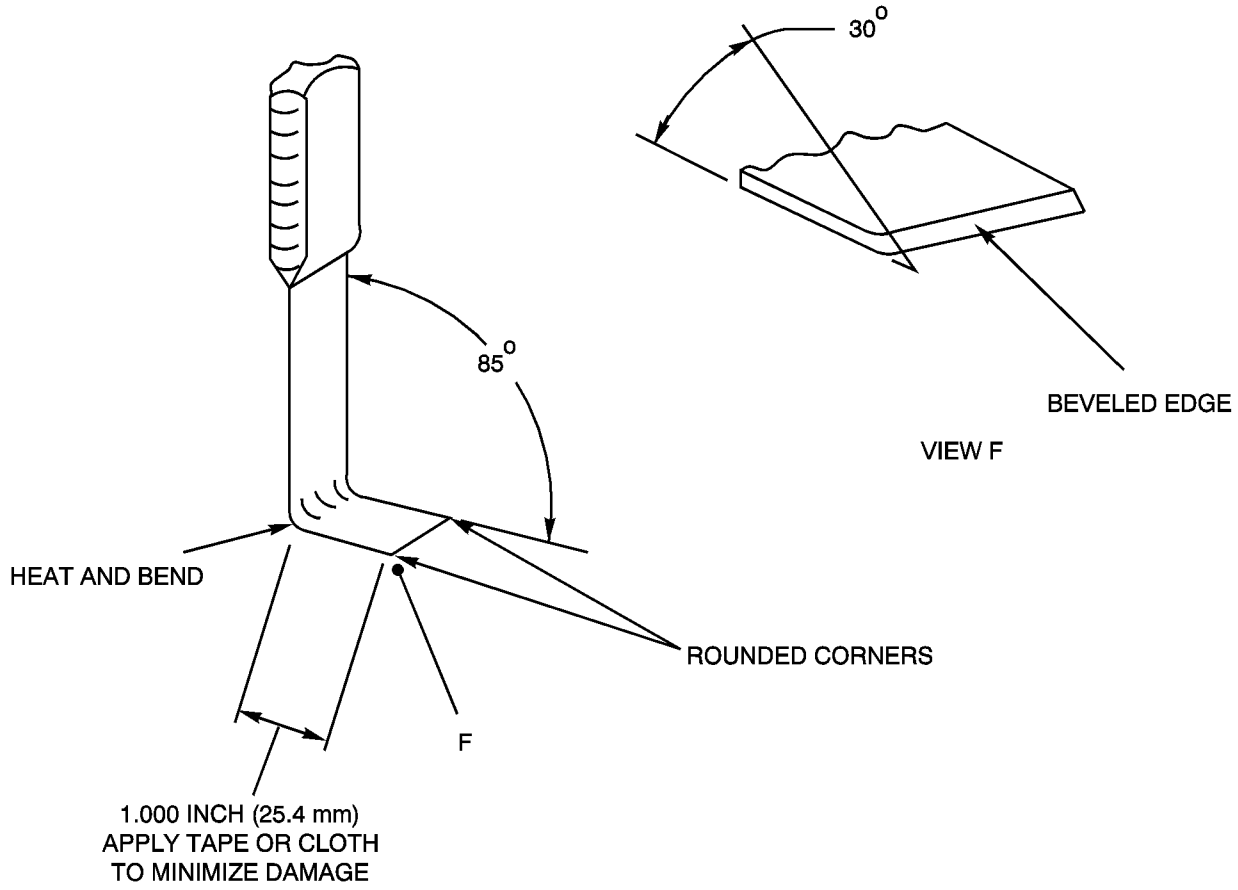
A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker
B.	Access Platform

ITEM	DESIGNATION
C. Material No.P05-038	Special Materials (Ref. 70-00-00)
D. Material No.P05-155	Special Materials (Ref. 70-00-00)
E. Material No.P05-203	Special Materials (Ref. 70-00-00)
F. Material No.P09-014	Sealants (Ref. 70-00-00)
G. Material No.P09-027	Sealants (Ref. 70-00-00)
H. Material No.P18-003	Primer (Ref. 70-00-00)
J.	Rivet, Blind
Referenced Procedures	
- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-13-00, P. Block 301	Cowl Doors

B. Job Set-Up
(1)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

C. Procedure (Ref. Fig. 809)
CAUTION : WHEN YOU REMOVE THE RIVETS, BE VERY CAREFUL NOT TO MAKE THE RIVET HOLES LARGER OR OUT OF ROUND.
(1)To remove the rivets, grind the rivet heads. Do not drill the rivets.
CAUTION : DO NOT USE A TOOL TO LIFT THE FAIRING FROM THE STRUT. TO USE A TOOL CAN CAUSE THE FAIRING TO DELAMINATE.
(2)Cut the sealant at the edges of the fairing.
(3)Remove the fairing.
CAUTION : DO NOT DAMAGE THE PARENT MATERIAL WHEN YOU REMOVE EXISTING SEALANT.
(4)Mechanically remove any damaged or unbonded sealant from the bonding surfaces of the fairing and the intermediate case assembly.
(5)Put rivet holes in the fairing.
(a)Put the new fairing in the correct position on the strut. Hold the fairing in the correct position with clamps.
(b)Where the five rivet holes on the strut are, make a mark on the fairing. Remove the fairing from the strut.
NOTE : There are seven holes for rivets in the strut. The new fairing uses only five of the holes that are there.
(c)Make marks for the nine additional rivet holes that are necessary.
CAUTION : DO NOT USE CUTTING FLUIDS OR LUBRICANTS WHEN YOU MACHINE THE RIVET HOLES. BE CAREFUL TO PROTECT THE MACHINED SURFACES FROM CONTAMINATION.
(d)Machine the nine new rivet holes.
(e)Machine the five existing rivet holes. The holes must be normal to the surface.
(6)Put rivet holes in the strut.
(a)Put the fairing in the correct position on the strut. Hold the fairing in the correct position with clamps.
(b)Machine nine new rivet holes from the fairing into the strut. Remove the fairings.



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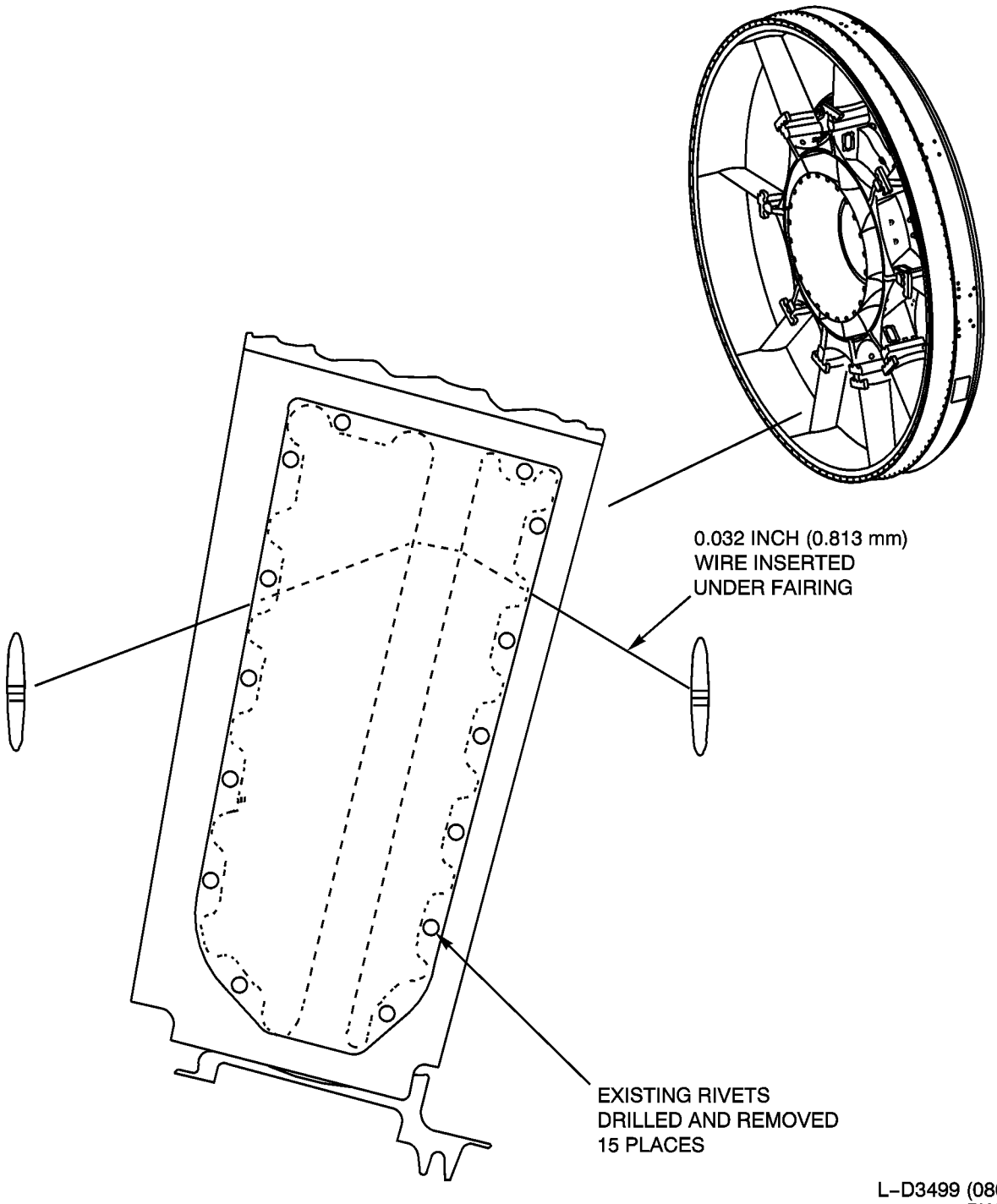
PW V

R Modified Putty Knife for Fairing Removal
Figure 803



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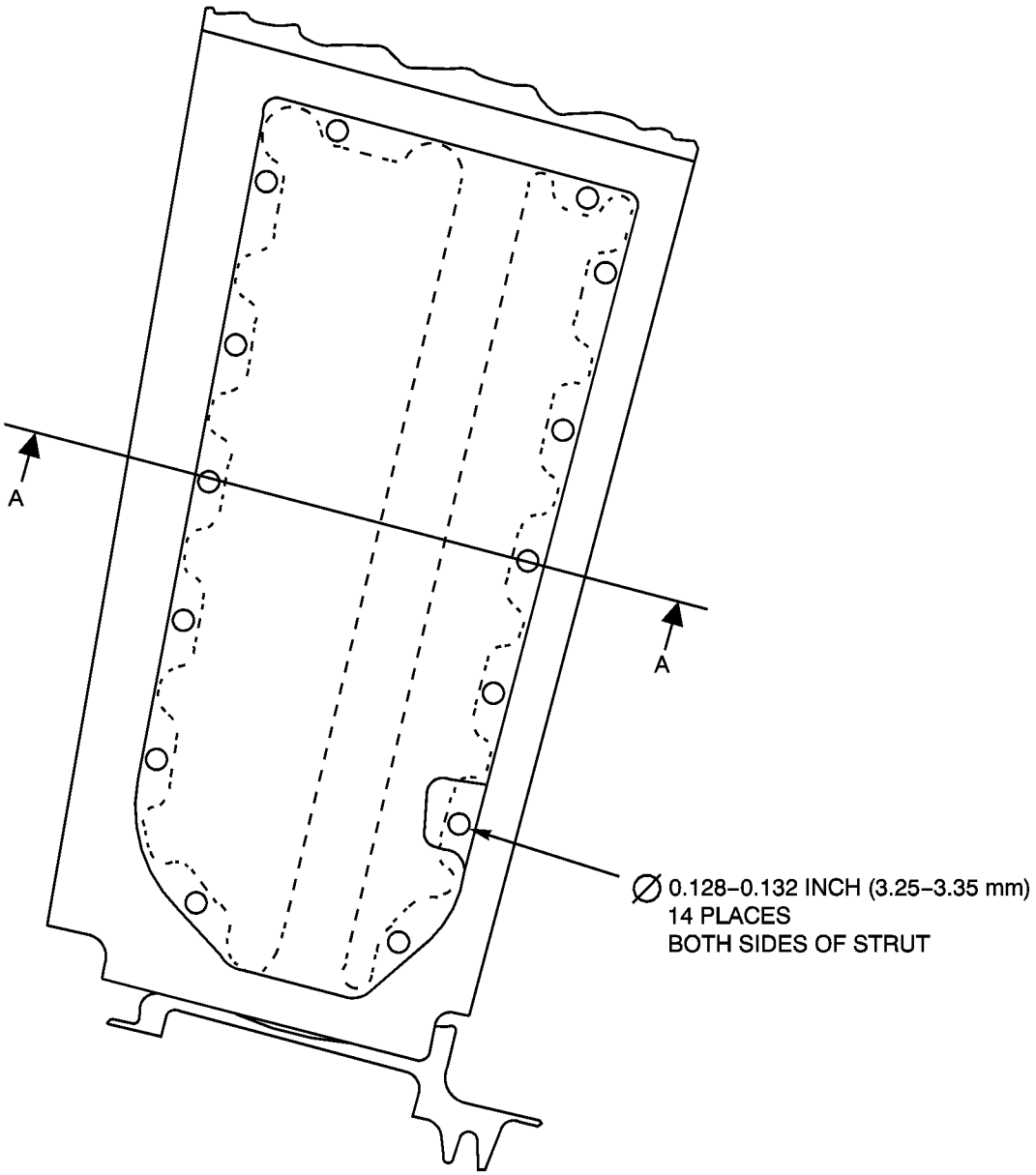
R Fairing Removal With Wire
Figure 804



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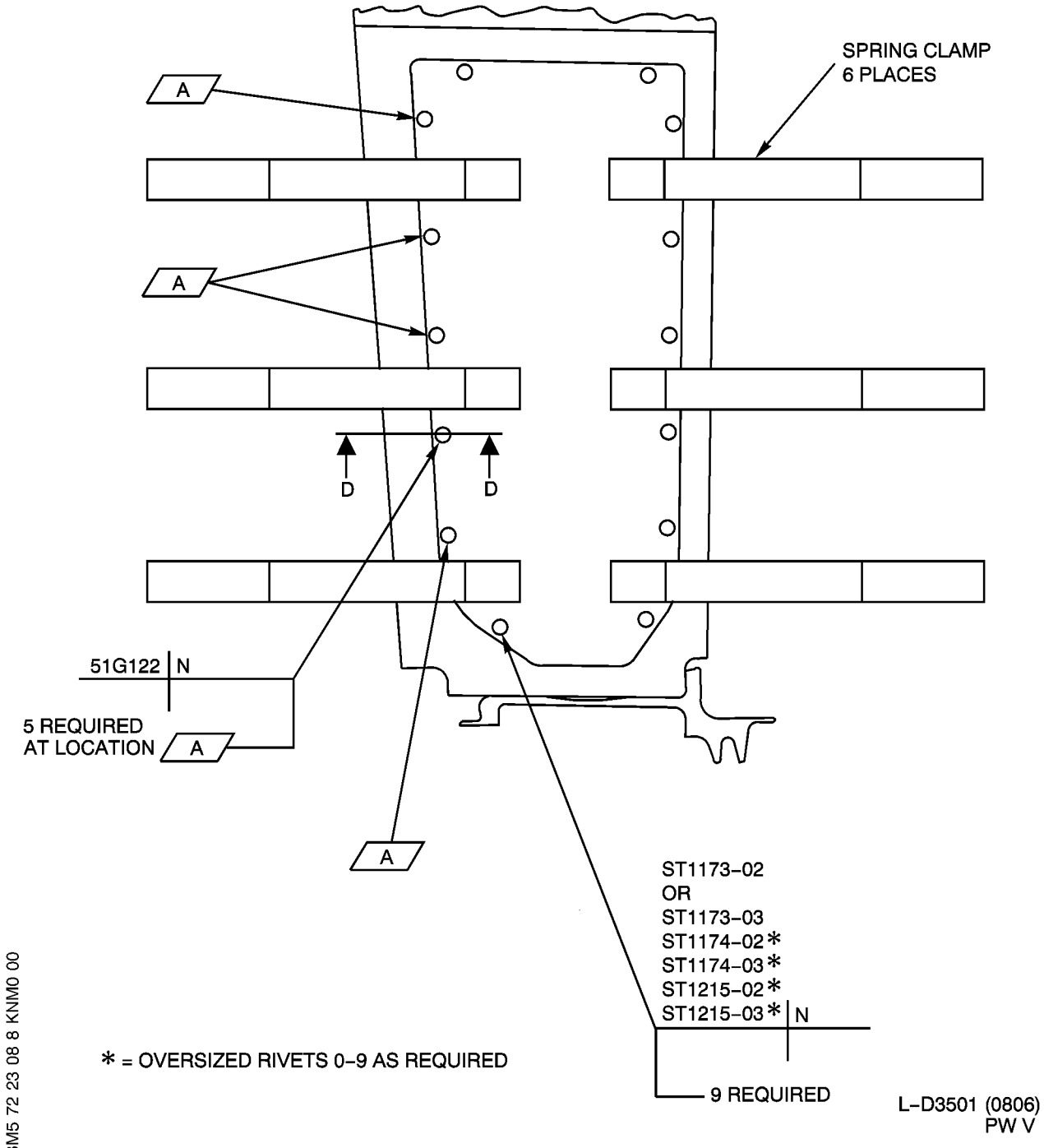
L–D3500 (0806)
PW V

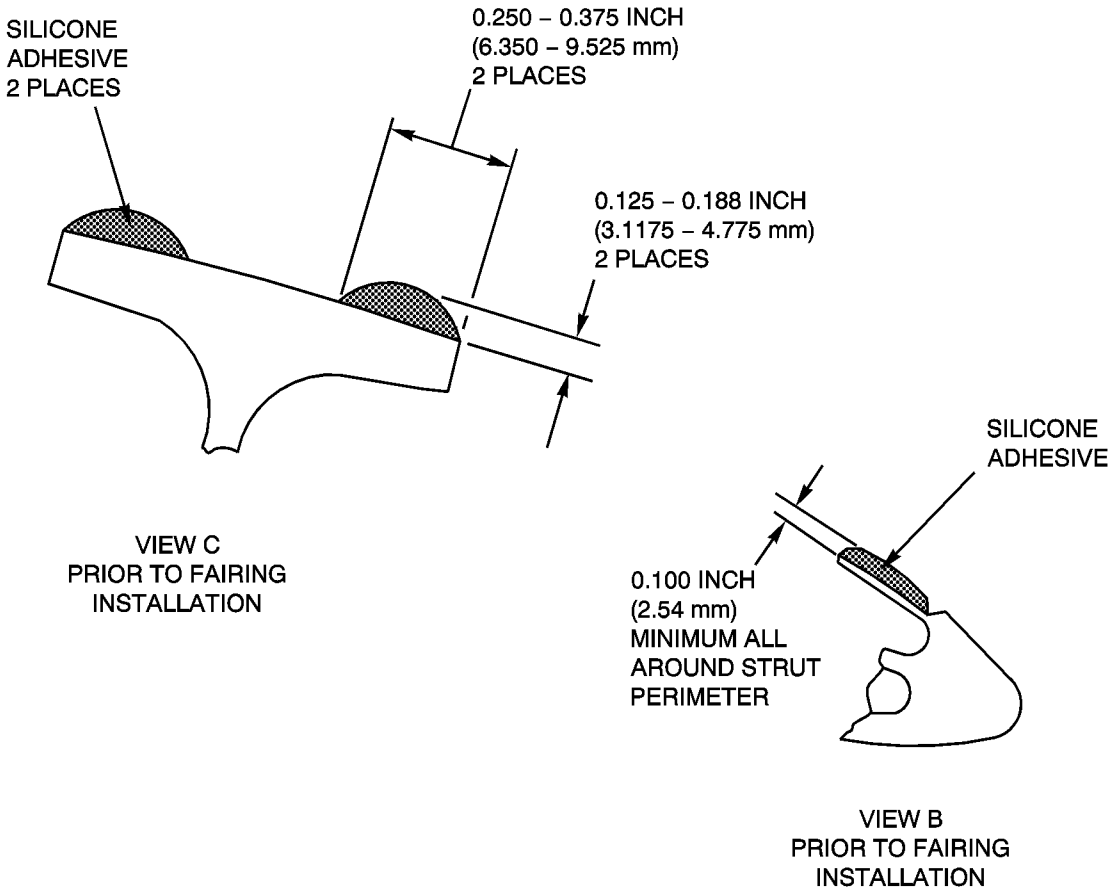
Typical Strut Rivet Holes
Figure 805

R



Rivet and Clamp Locations
Figure 806

R



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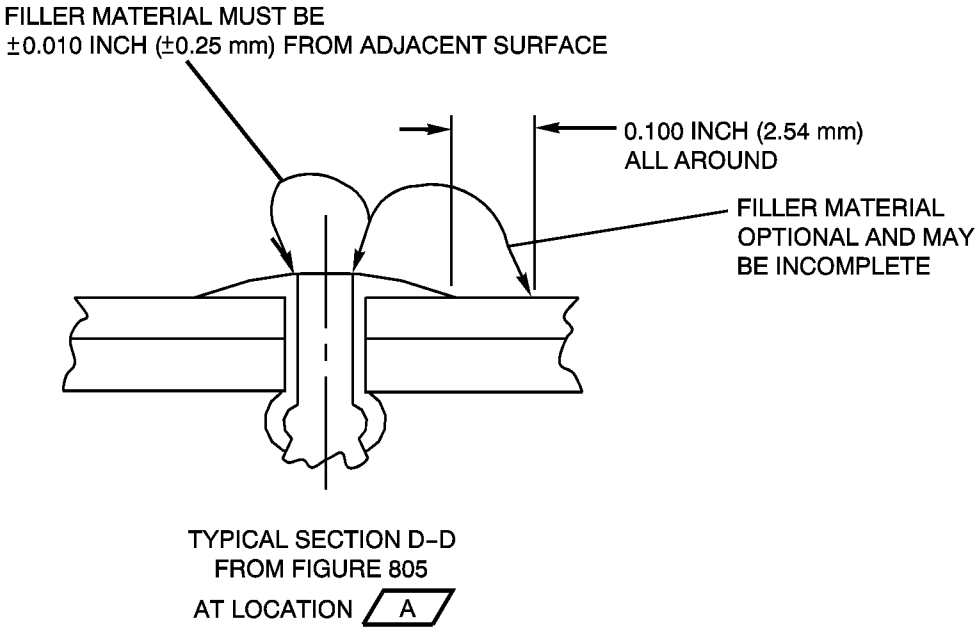
L–D3502 (0806)
PW V

R

Location of Silicone Adhesive
Figure 807

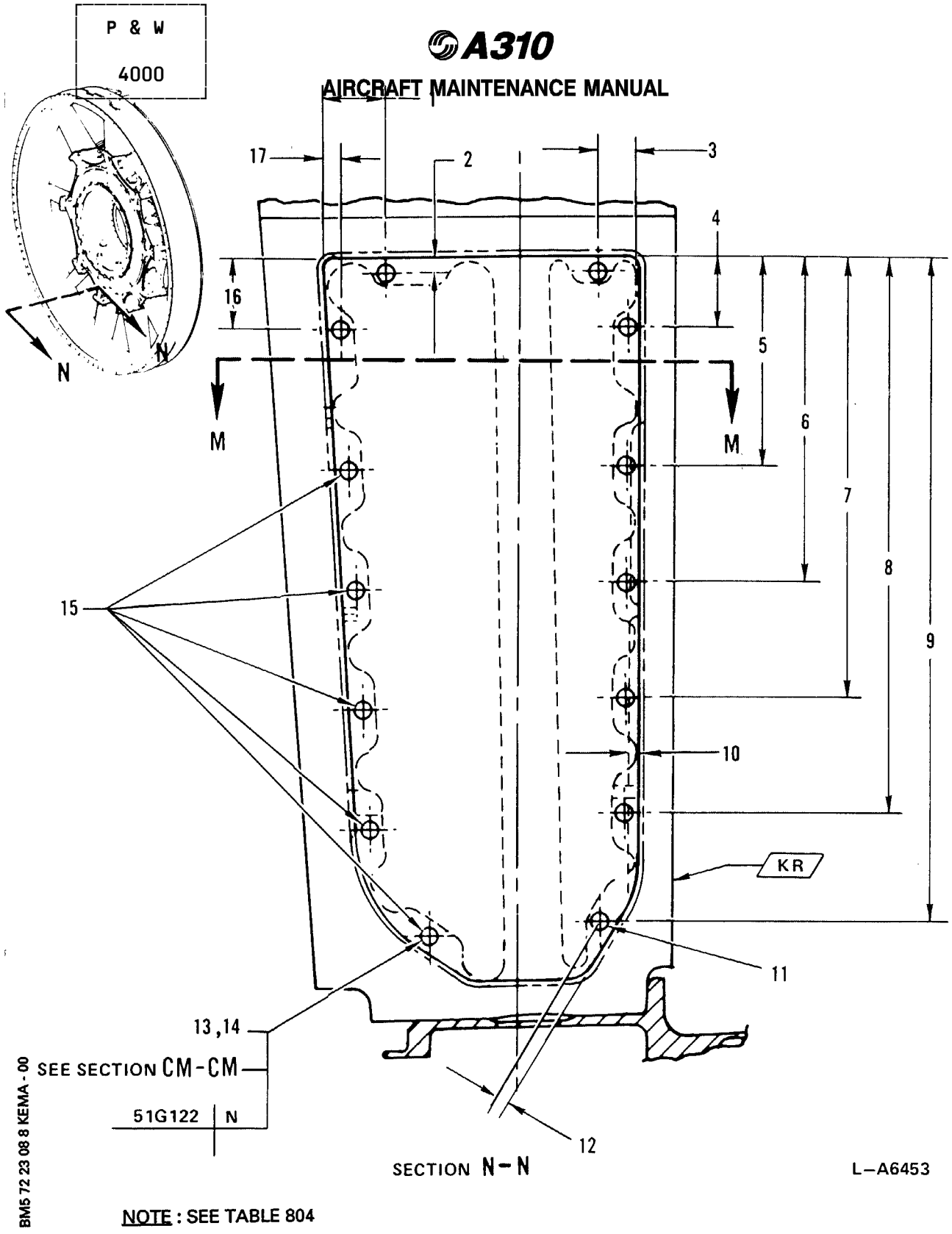


L-D3503 (0806)
PW V

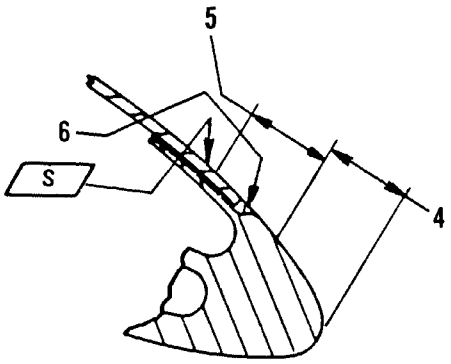
BM5 72 23 08 8 KSM0 00

R

Apply of Silicone Adhesive
Figure 808



Fairing with Rivets on Trailing Edge Replaced by Fairing with Rivets all Around (Sheet 1/2)
Figure 809



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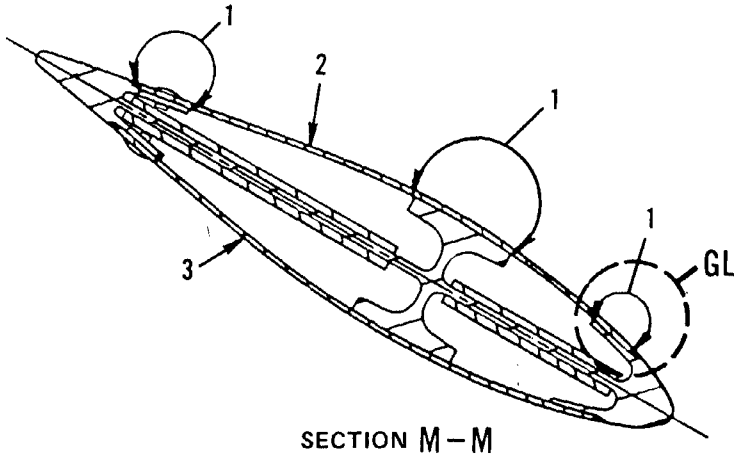
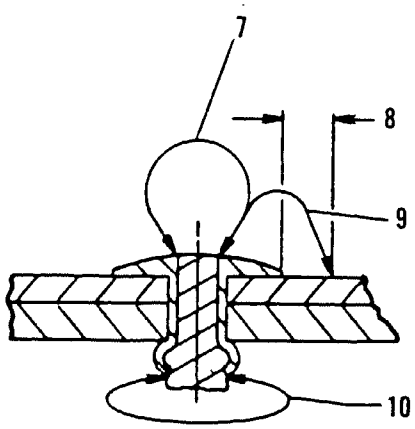


SECTION M–M



CM–CM
TYPICAL 14 PLACES

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NOTE : SEE TABLE 805

Fairing with Rivets on Trailing Edge Replaced
by Fairing with Rivets all Around (Sheet 2/2)
Figure 809

(c)Deburr the new holes in the strut. Remove the least material possible. Remove unwanted material from the strut and fairing.

(7)Clean the parts of the strut, fairing, and intermediate case that the sealant will touch.

(a)Make wet a piece of clean Material No.P05-038 with a SPOP 208 solvent (Ref. 70-00-00, P. Block 201).

(b)Wipe the repair area with the cheesecloth.

(c)Dry the surfaces fully in air that is at room temperature.

(d)If you do not apply the sealant immediately, cover the cleaned parts with Material No.P05-155 or No.P05-203.

(e)You must apply the sealant in two hours.

(8)Apply either sealant Material No.P09-014 or Material No.P09-027 to the mating surfaces of the strut.

(9)Attach the fairing to the strut with clamps.

(10)Apply Material No.P18-003 to the rivets. Rivet the fairing to the strut. Inspect the rivets for cracks, clearance, and correct seating.

(11)Fill the gaps and edges with either sealant Material No.P09-014 or Material No.P09-027.

(a)Remove unwanted sealant with Material No.P05-038.

(b)Cure the sealant :

1 At room temperature.

2 In air that has a relative humidity of 25 percent, minimum.

3 Until it is no longer tacky and for two hours, minimum, before you touch it. If possible, cure the sealant for eight hours total, before operation of the engine.

D. Fairing Replacement Designation Tables (Ref. Fig. 809)

ITEM	DESIGNATION
1.	1.441 in. (36.601 mm)
2.	0.273 in. (6.934 mm), two places
3.	1.009 in. (25.629 mm)
4.	1.429 in. (36.297 mm)
5.	4.363 in. (110.820 mm)
6.	6.778 in. (172.161 mm)
7.	9.193 in. (233.502 mm)
8.	11.603 in. (294.716 mm)
9.	13.870 in. (352.298 mm)
10.	0.355 in. (9.017 mm) typical five places.
11.	0.104 - 0.114 (2.64 - 2.90 mm), nine holes through the fairing only, normal to the surface. 0.128. - 0.132 in. (3.252 - 3.352 mm), nine holes through the fairing and strut normal to the surface.
12.	0.450 in. (11.430 mm)
13.	0.128 - 0.132 in. (3.252 - 3.352 mm), five holes through the fairing, normal to the surface.
14.	Within a diameter equal to twice the diameter of the manufactured head, it is permitted for

ITEM	DESIGNATION
	the maximum clearance between faying surfaces to be 0.005 in. (0.127 mm).
15.	Existing rivet positions, five places.
16.	1.421 in. (36.093 mm).
17.	0.385 in. (9.779 mm).

Table 804

ITEM	DESIGNATION
1.	Apply sealant in this area all around.
2.	P/N 51G831-01
3.	P/N 51G832-01
4.	0.300 in. (7.620 mm) minimum. This dimension is correct for surface KR only.
5.	0.500 in. (12.700 mm) maximum.
6.	The sealant must be ± 0.015 in. (0.381 mm) from surface S all around, both sides.
7.	The sealant must be ± 0.010 in. (0.254 mm) from the adjacent surfaces.
8.	0.100 in. (2.540 mm) all around.
9.	The sealant is optional and can be incomplete.
10.	This surface can be irregular. No control is necessary.

Table 805

E. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Remove access platform.
(3)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

COMPRESSOR SECTION - DESCRIPTION AND OPERATION

1. Description

The purpose of the high pressure compressor is to further compress air delivered by the front compressor and to feed this air into the combustion section.

The compressor rotor and stator group consists of 5th through 15th stage rotors, 5th through 14th stage stators and cases, compressor case, and turbine driveshaft. This assembly is connected to the rear flange of intermediate case and the front flange of the diffuser case.

1. Replace Helical Coil Inserts (AP-2 through AP-7) into HPC Front and Rear Case Assembly

A. Equipment and Materials

ITEM	DESIGNATION
A.	Inserting Tool (535-9)
B.	Extracting Tool (1227-16)
C.	Inserting Tool (7552-8)
D.	Inserting Tool (535-161)
Referenced Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 72-00-00, P. Block 601	Engine - General

NOTE : These tools are available at :
Heli-Coil
Division of Emhart Industrial
510 River Road
Danbury, CT 06810 USA

B. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open the thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.
(3)Remove applicable borescope plug/plugs from port at locations AP-2, AP-3, AP-4, AP-5, AP-6, or AP-7 (Ref. 72-00-00, P. Block 601).

C. Procedure
NOTE : Helical coil may backout when borescope plug is removed. If this occurs, only insert installation applies. See Table 801 for tool usage.
(1)Remove insert as follows :

Threaded Insert Location	Extracting Tool	Inserting Tool	Break-Off Tool
AP-2	1227-16	535-9	Long-Nose Pliers
AP-3	1227-16	535-9	Long-Nose Pliers
AP-4	1227-16	535-9	Long-Nose Pliers
AP-5 (Inner)	1227-16	7552-8	Long-Nose Pliers
AP-5 (Outer)	1227-16	535-161	Long-Nose Pliers
AP-6	1227-16	535-9	Long-Nose Pliers
AP-7 (Inner)	1227-16	7522-8	Long-Nose Pliers
AP-7 (Outer)	1227-16	535-161	Long-Nose Pliers

Part Number/Tool Cross-Reference
Table 801

(a)Place extracting tool blade into hole so that one side of blade is 1/4 turn from end of insert.
(b)Strike head of tool lightly with hammer, enough to drive blade into top coil of insert.
(c)Bearing down hard on tool handle, turn it slowly counterclockwise, maintaining pressure on tool handle as insert backs out.

(2)Install internal insert (two borescope ports) as follows :

NOTE : The external diameter of the insertion tool must be capable of fitting through the minimum diameter of the external borescope port.

(a)Place smaller insert on tip of corresponding insert tool, and position tool with insert through outer borescope hole and into inner threaded borescope hole.
(b)Turn tool handle clockwise. Thread insert into hole, 1 - 1.5 pitch below outer surface of boss.

CAUTION : DO NOT ALLOW TANG TO FALL INTO ENGINE.

(c)Use long nose pliers or equivalent, work tang in back and forth motion until it breaks loose.
Remove tang.

(3)Install external insert (one borescope port) as follows :
(a)Place larger insert on tip of corresponding insert tool, and position tool with insert into borescope threaded hole.
(b)Turn tool handle clockwise. Thread insert into hole, 1 - 1.5 pitch below outer surface of boss.

CAUTION : DO NOT ALLOW TANG TO FALL INTO ENGINE.

(c)Use long nose pliers or equivalent, work tang in back and forth motion until it breaks loose. Remove tang.

D. Close-Up
(1)Reinstall applicable borescope plug (Ref. 72-00-00, P. Block 601).
(2)Remove access platform.
(3)Close thrust reverser cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

HIGH PRESSURE COMPRESSOR ROTOR - DESCRIPTION AND OPERATION

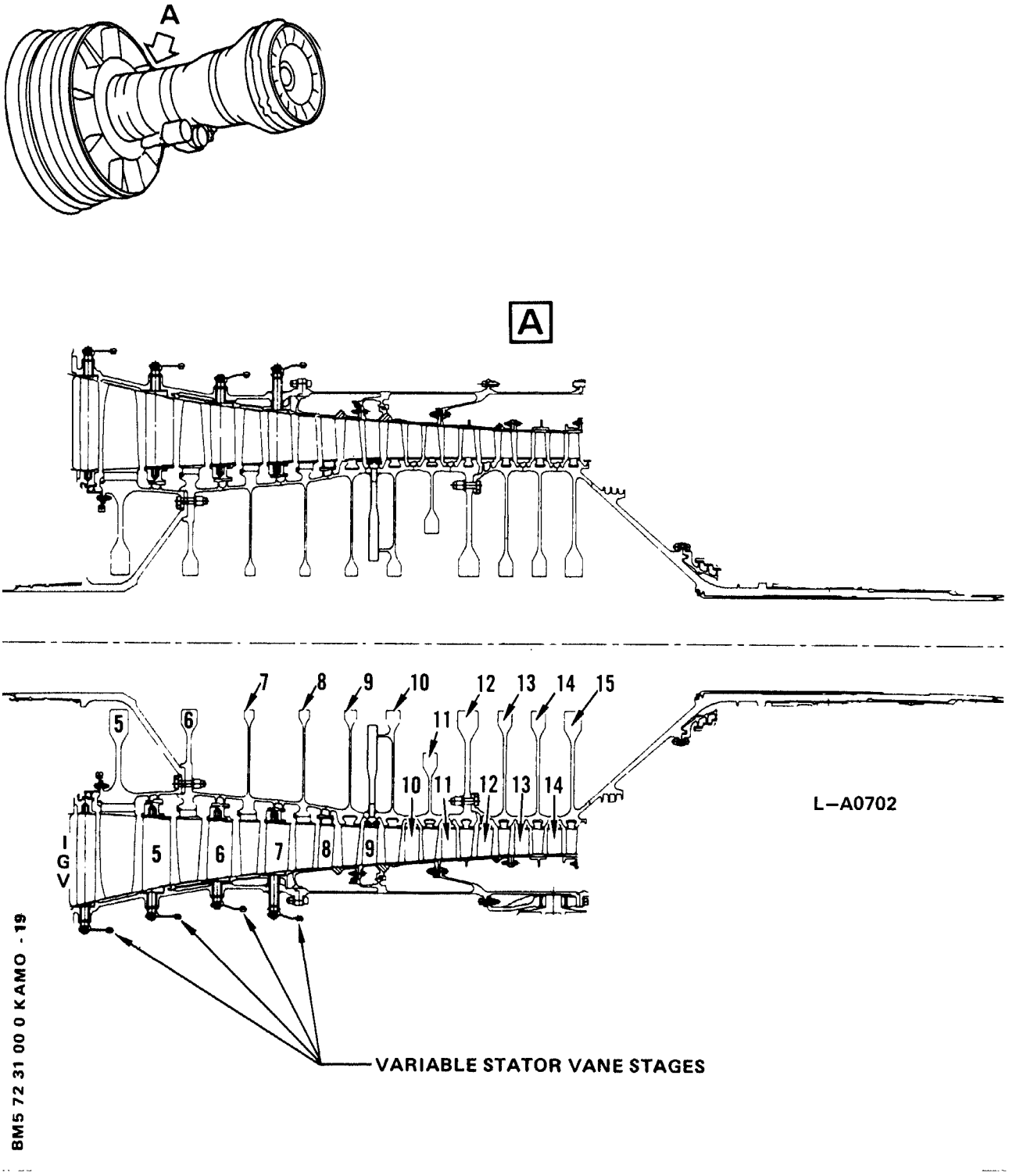
1. Description (Ref. Fig. 001)

A. The high pressure compressor rotor assembly which consists of the 5th through 15th rotor stages is driven by the high pressure turbine via the high pressure compressor rear hub/turbine shaft. The hub is integral with the 13th, 14th and 15th stage disks which are welded together as an assembly. The 6th through 12th stage disks are also welded together as an assembly. The 5th disk and front hub are bolted to the front of the 6th disk while the 13th, 14th, 15th, rear hub assembly is bolted to the rear of the 12th disk. All rotating knife edge airseals are integral with each disk except for the forward 5th and rear hub inner seals which are bolted in place.

B. The rear hub/turbine shaft is supported by the No.3 bearing while the front hub is supported by the No.2 bearing. The front hub is mechanically connected to the angle gearbox tower shaft by means of a ring and pinion gear set.

C. The fifth through twelfth stage rotor disks are titanium. Thirteenth, fourteenth and fifteenth stage rotor disks are nickel alloy. Fifth through thirteenth stage rotor blades are titanium. Fourteenth and fifteenth stage rotor blades are nickel alloy.

D. Fifth, sixth, and seventh stage rotor ducts, which are attached to stator cases, serve as rotor blade tip seal for 5th, 6th, and 7th stage rotor blades. These stainless steel ducts are filled with an abradable material to give a tight blade tip seal at these points. All other blade tip seals are made of sintered nickel chromium porous metal bonded onto solid parts.



Rear Compressor
Figure 001

FIRST STAGE COMPRESSOR STATOR - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A. PWA85685	Puller, Knocker
B. Material No.P03-001	Oils (Ref. 70-00-00)
C.	Torque Wrench
Referenced Procedures	
- 72-21-02, P. Block 401	First Stage Compressor Rotor (Fan) Blade Assembly
- 71-00-00, P. Block 501	Power Plant - General

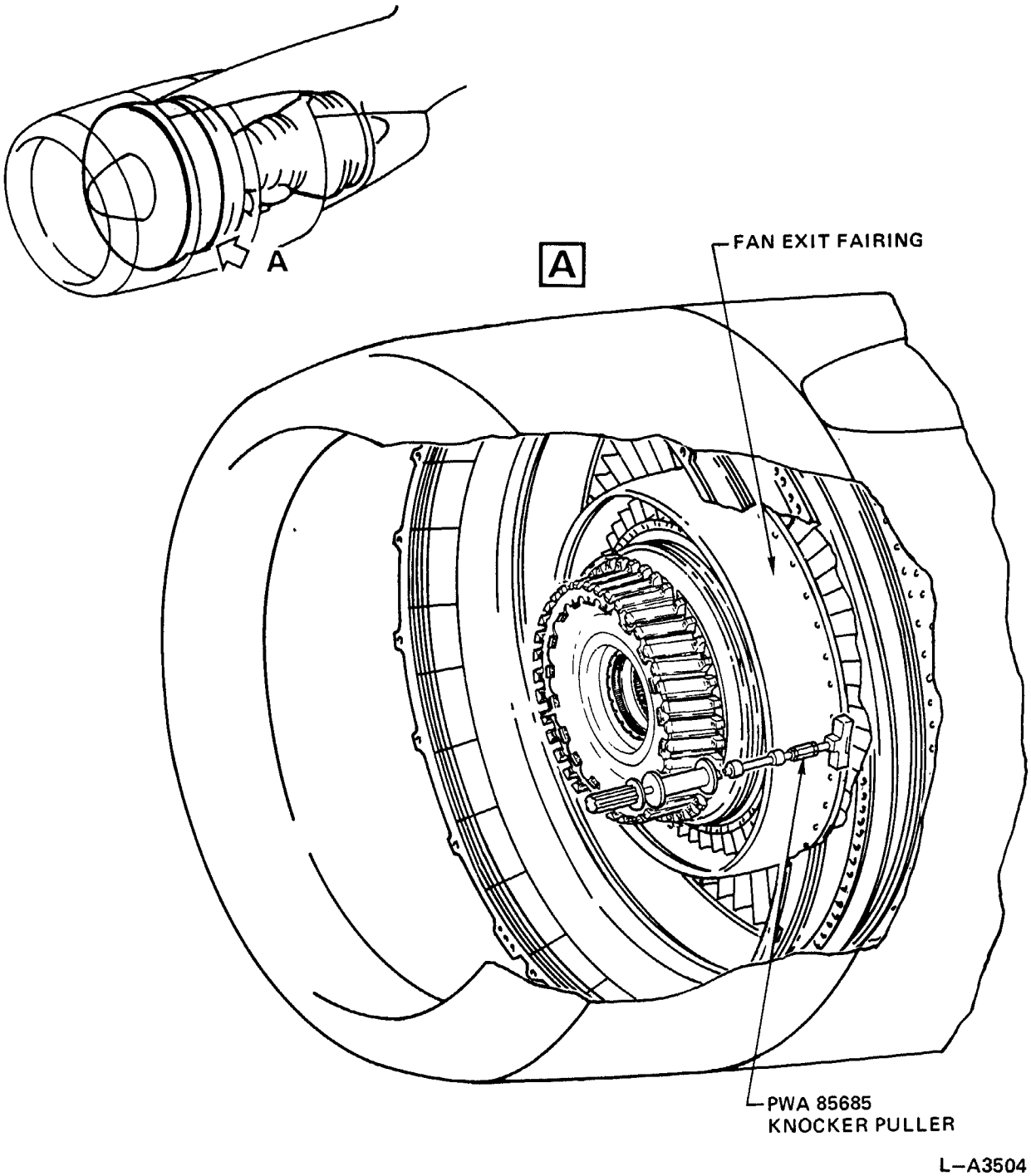
2. Procedure

A. Job Set-Up
(1)Remove first stage compressor rotor (Fan) blade assembly (Ref. 72-21-02, P. Block 401).

B. Removal (Ref. Fig. 401)
(1)Install suitable protector on ID of fan case at 6 o'clock position to protect rubstrip.
(2)Remove 36 screws securing fan exit fairing (splitter). Using PWA85685 Puller, small tooth side, in one of nine slots on rear OD of fairing. Remove fairing until able to use opposite side of puller Jaw to complete removal of fairing.
(3)Remove bolts, washers and nuts securing first stage compressor stator outer flange.
(4)Using fiber mallet, gently tap OD of flange to loosen stator assembly. Remove stator assembly from engine.

C. Installation (Ref. Fig. 402)
(1)Install first stage compressor stator to engine aligning offset holes at approximately the 3 and 9 o'clock positions.
(2)Secure stator in place with bolts threads lubricated with Material No. P03-001, washers (under boltheads and under nuts) and nuts. Tighten bolts evenly to seat flange. TORQUE bolts to between 36 and 40 lbf. in. (0.41 and 0.45 m.daN).
(3)Install fairing (splitter) over first stage compressor stator OD engaging front lip of fairing with front flange of stator and aligning holes in fairing with holes in fan exit case and vane assembly inner front flange. Secure fairing with screws threads lubricated with Material No.P03-001. TORQUE screws to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
(4)Remove protector from ID of fan case.

D. Close-Up and Test
(1)Install first stage compressor rotor (Fan) blade assembly (Ref. 71-00-00, P. Block 401).



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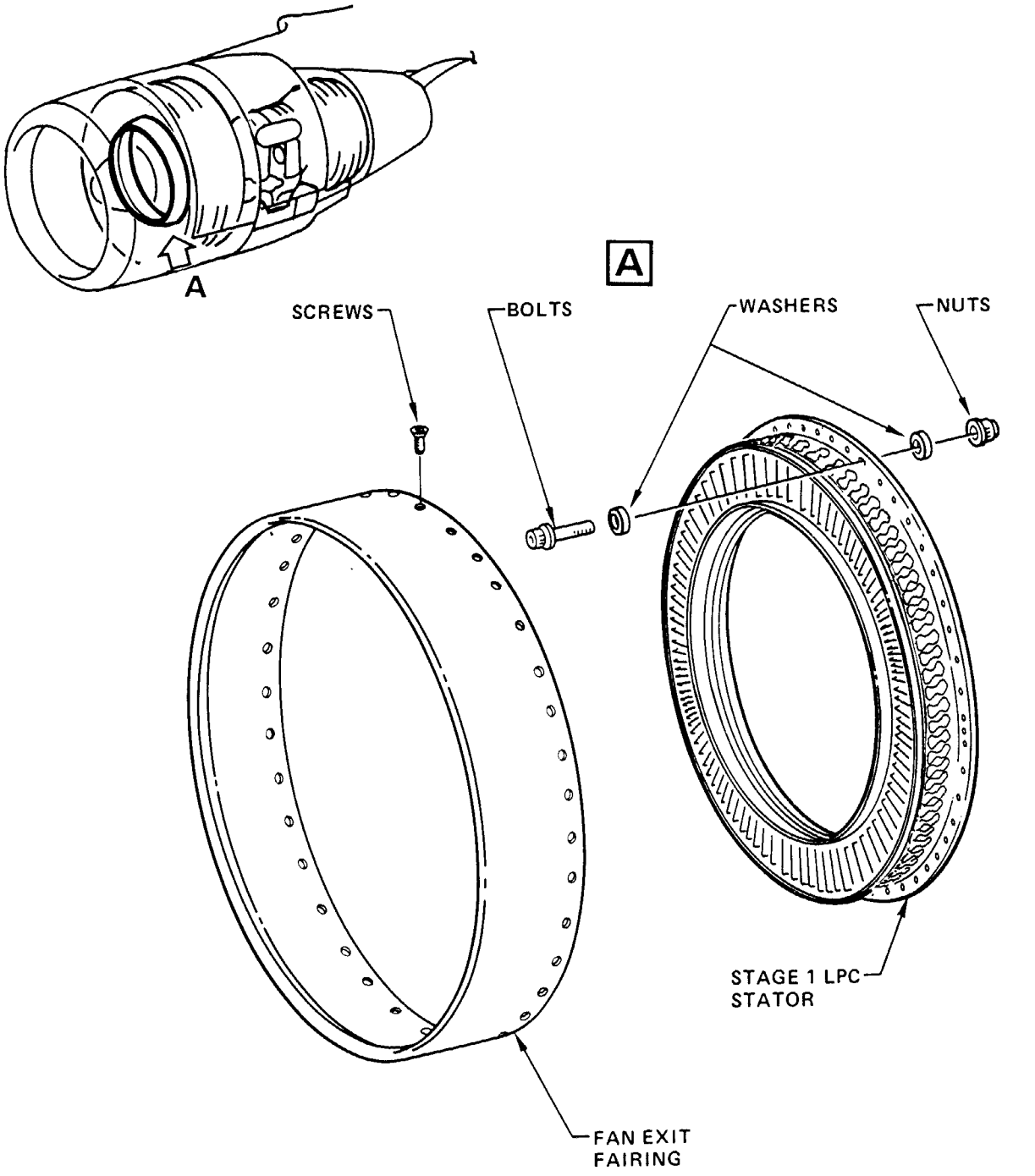
Fan Exit Fairing Knocker Puller
Figure 401



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First Stage Compressor Stator
Figure 402

FIRST STAGE COMPRESSOR STATOR ASSEMBLY - INSPECTION/CHECK

1. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedures	
- 70-00-00, P. Block 201	Standard Practices - Engine
- 72-21-02, P. Block 401	First Stage Compressor Rotor (Fan) Blade Assembly
- 72-31-02, P. Block 401	First Stage Compressor Stator
- 72-31-02, P. Block 801	First Stage Compressor Stator
- 72-21-05, P. Block 601	Stage 1.6 LPC Blade

2. Procedure

A. Job Set-Up
(1)Remove first stage compressor rotor (fan) blade assembly (Ref. 72-21-02, P. Block 401).
(2)Remove first stage compressor stator (Ref. 72-31-02, P. Block 401).

B. Inspect First Stage Compressor Stator Vane
(1)Inspect the stage 1 LPC stator for damage. See tables 601 and 602 (Ref. Fig. 601, 602).
(a)If the stage 1 stator is damaged, you must remove the stator and examine the stage 1.6 blades (Ref. 72-21-05, P. Block 601).
(b)Surface damage limits apply to damage after you blended it and not to the damage before you blended it.
(c)All repaired areas of the vane must be smooth.

Inspect	Serviceable limits	Repairable limits	Repair
All areas for :			
Pits, corrosion	Damage not permitted	Depth of the damage equals 12 percent of the local vane thickness, maximum	-01
Damage that is visible on the opposite side of the vane	Damage not permitted	Not repairable	
Convex surface for damage	Damage not permitted	5 percent of the surface area maximum	-01

Inspect	Serviceable limits	Repairable limits	Repair
		15 : 1 length : depth ratio minimum	
Concave surface for :			
Dents with rounded bottoms	Permitted	No limit	
Other damage	Damage not permitted	20 percent of the surface area maximum 15 : 1 length : depth ratio minimum	-01
Leading and trailing edges (LE and TE) for damage Length, each incident		0.500 in. (12.70 mm) maximum	
Length, total, all LE and TE blends, each vane		0.500 in. (12.70 mm) maximum	
Length, total, all LE and TE blends, all vanes		6.000 in. (152.4 mm) maximum	
Blends that are at the maximum depth on both LE and TE Radial Separation of LE and TE blends		mean chordal length, minimum	
Blends that are at less than the			

Inspect	Serviceable limits	Repairable limits	Repair
maximum depth on both LE and TE Radial separation of LE and TE blends	No limit		
Depth, total, all blends		Total depth of all blends must not be more than the maximum depth permitted for one blend.	
All areas Quantity of blends		2 to the maximum depth	
Radial length : depth		4 : 1	

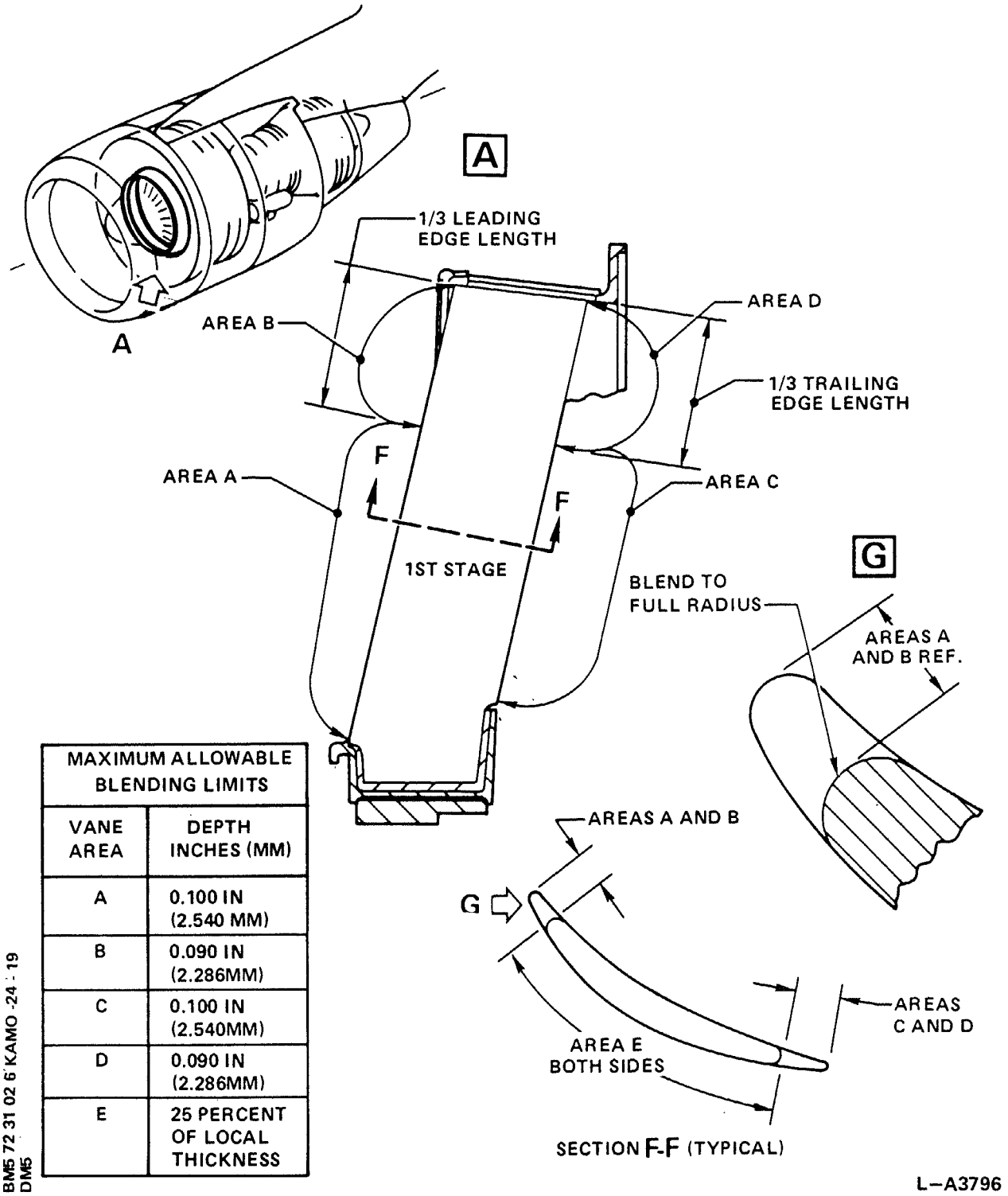
Visual Inspection of the Vanes
Table 601

Inspect	Serviceable limits	Repairable limits	Repair
Sealing compound for :			
Very small cracks (called crazing) and dryness and areas where there is little bond between the sealing compound and the vane or shroud	Permitted if the vane is not loose	A loose vane is not permitted.	

Visual Inspection of the Inner Shroud
Table 602

C. Fluorescent Penetrant Inspect First Stage Compressor Stator Vanes
(1)Perform fluorescent penetrant inspection of first stage compressor stator vanes per SPOP 70. Use ultra high sensitivity penetrant (Ref. 70-00-00, P. Block 201). Cracks shall be cause for rejection.

D. Close-Up
(1)Install first stage compressor stator (Ref. 72-31-02, P. Block 401).
(2)Install first stage compressor rotor (fan) blade assembly (Ref. 72-21-02, P. Block 401).



MAXIMUM ALLOWABLE BLENDING LIMITS	
VANE AREA	DEPTH INCHES (MM)
A	0.100 IN (2.540 MM)
B	0.090 IN (2.286MM)
C	0.100 IN (2.540MM)
D	0.090 IN (2.286MM)
E	25 PERCENT OF LOCAL THICKNESS

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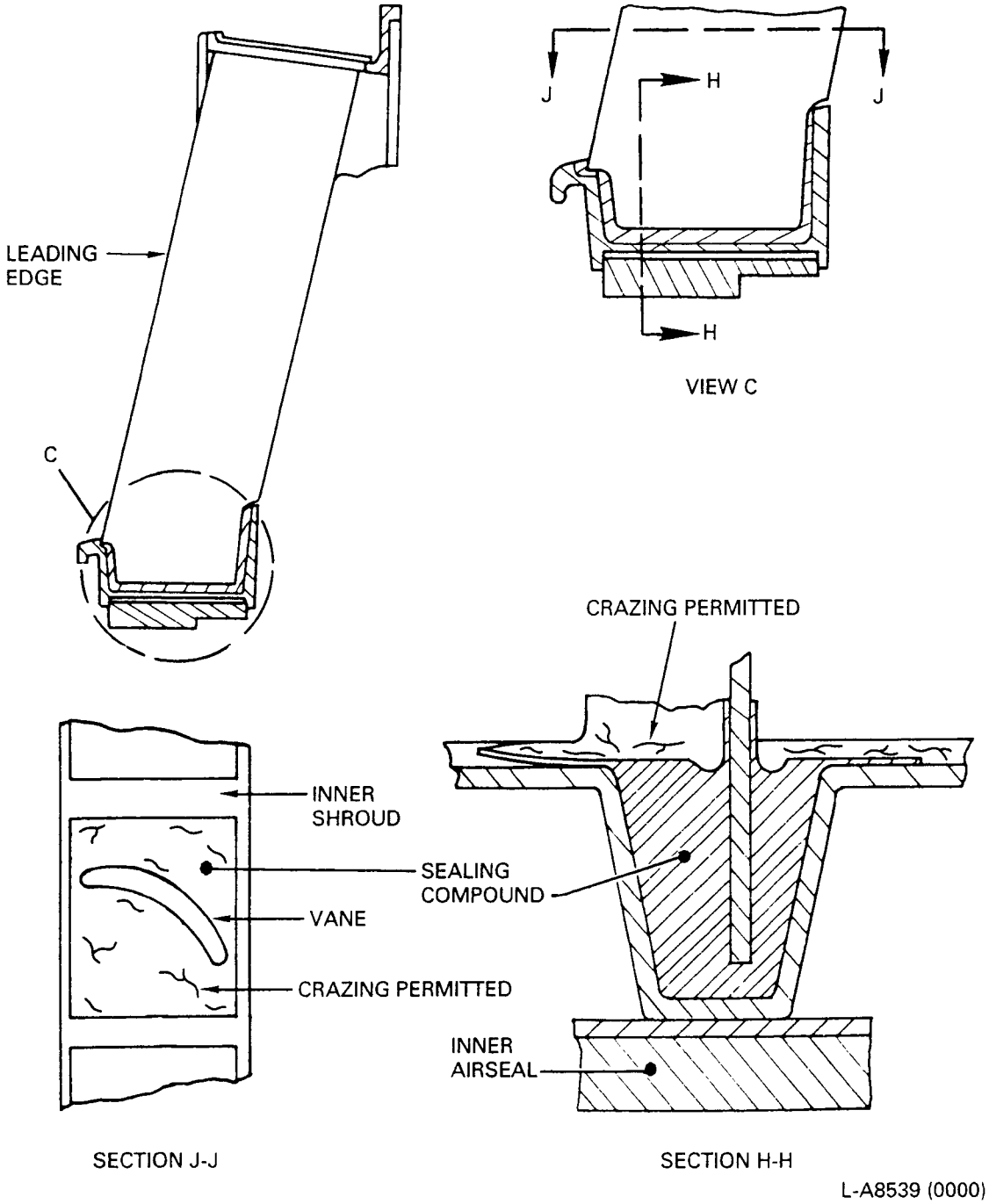
DM5

Stage 1 LPC Stator Vane Blend Depth Limits
Figure 601



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Visual Inspection of the Inner Shroud
Figure 602

STAGE1 LPC STATOR - APPROVED REPAIRS

1. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedure - 70-00-00, P. Block 201	Engine - Standard Practices

2. Blend Repair Stage 1 LPC Stator

NOTE : Limits apply to damaged areas after blending and not to magnitude of damage measured before blending.
Amount of material removed should be minimized on all vane repairs.

A. Blend repair airfoil section of stator per limits specified in (Ref. Fig. 801). Additional requirements are as follows :

(1) Injuries to concave and convex airfoil surfaces may be blended to the following limits :
  (a) Convex surface : 5 percent maximum of concave surface area.
  (b) Concave surface : 20 percent maximum of concave surface area. Round bottom dents are acceptable without blending.

(2) Total length of combined leading edge and trailing edge or leading edge and trailing edge blends singly, must not exceed 0.500 in. (12.700 mm) per vane.

(3) Not more than two repairs to the maximum depth limit are allowed per vane.

(4) Radial length of blend must be a minimum of four times the depth of the nick.

(5) Blends to maximum depth on both leading and trailing edge must not be at the same radial station and must be radially separated by not less than the mean choral length.

(6) Slends not to maximum depth limit on leading and trailing edge and within vane chordal length radial spacing, are acceptable only if combined blended leading edge depth and blended trailing edge depth does not exceed above single blend nick limit.

(7) A maximum of 6.000 in. (152.4 mm) total leading edge and/or trailing edge blend length repair is allowed in vane and shroud assembly.

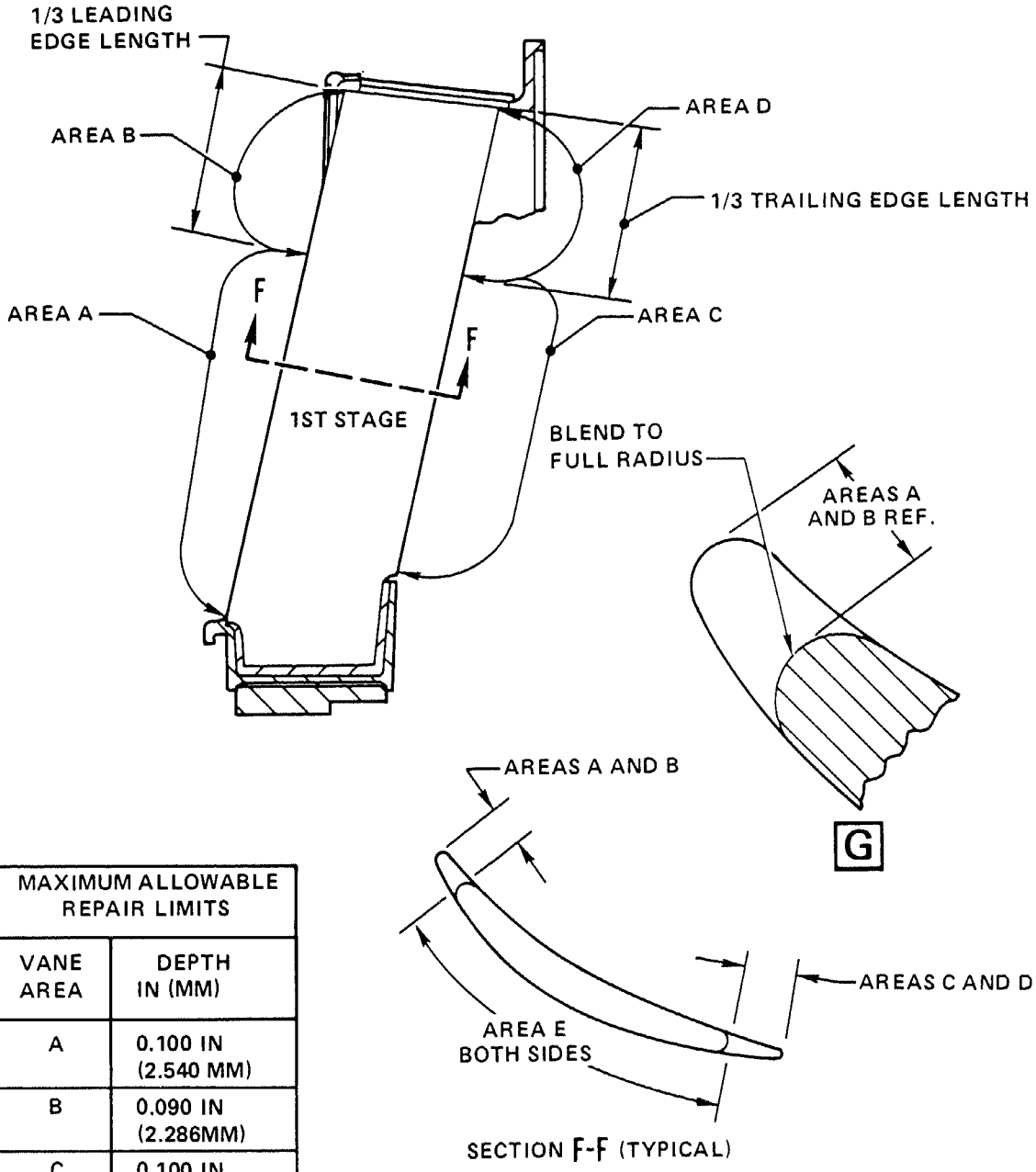
(8) All local blending on concave and convex sides must extend over an area at least 15 times depth of injury.

(9) Pitting and corrosion are reparable provided pitting not exceed 12 percent of local vane thickness.

(10) Surface finish on repaired vane must be comparable to that of a new vane.

(11) Damage which can be seen on opposite side of vane is unacceptable.

B. Fluorescent penetrant inspect repaired vanes per SPOP 70 (Ref. 70-00-00, P. Block 201)
To ensure that all traces of damage have been removed. Use ultra high sensitivity penetrant. Any crack is cause for rejection.



MAXIMUM ALLOWABLE REPAIR LIMITS	
VANE AREA	DEPTH IN (MM)
A	0.100 IN (2.540 MM)
B	0.090 IN (2.286MM)
C	0.100 IN (2.540MM)
D	0.090 IN (2.286MM)
E	25 PERCENT OF LOCAL THICKNESS

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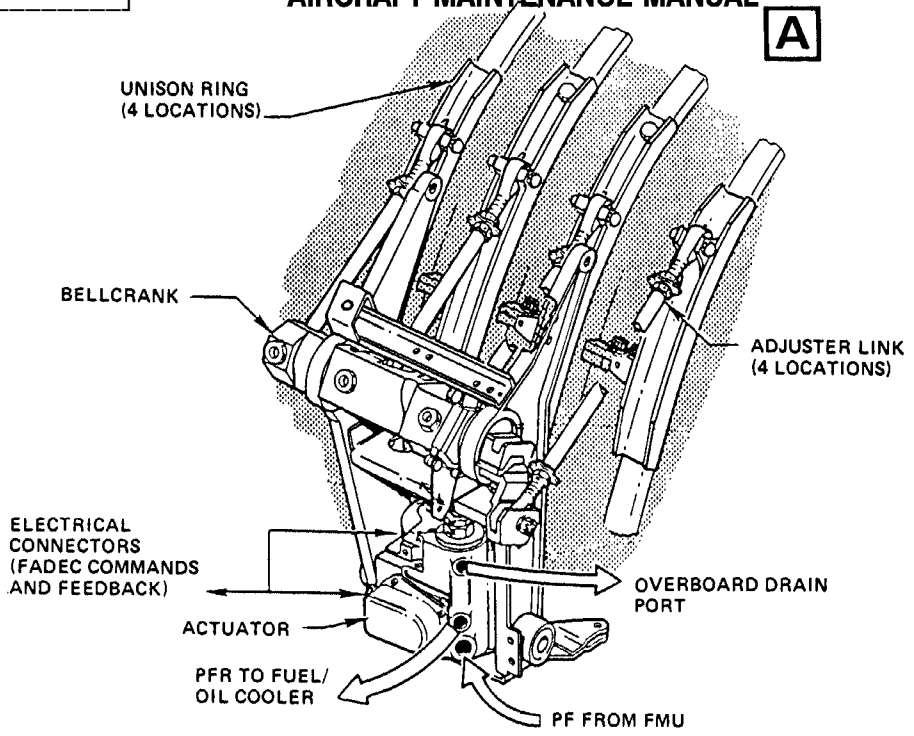
Stage 1 LPC Stator Blend Limits
Figure 801

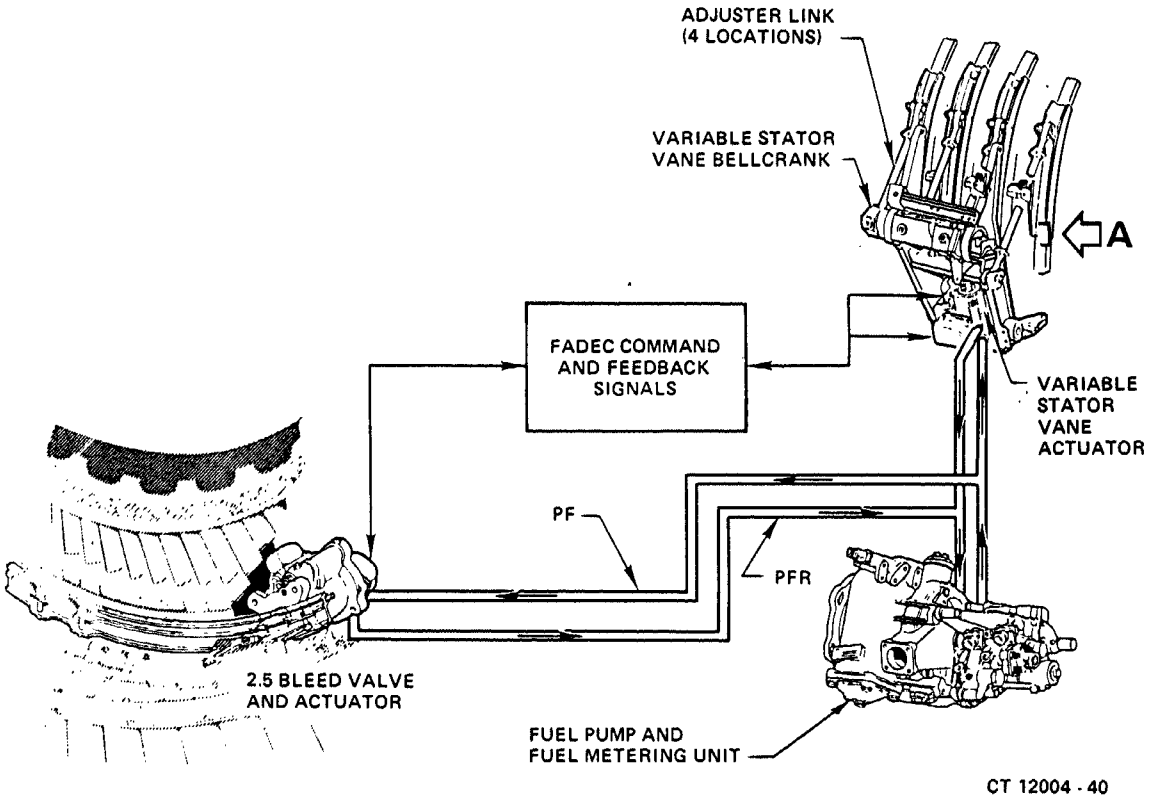
COMPRESSOR VARIABLE STATOR ASSEMBLY - DESCRIPTION AND OPERATION

1. Description (Ref. Fig. 001)

A. Inlet guide vanes, 5th, 6th, 7th stage stators are variable and are automatically positioned by the stator vane actuator to provide adequate stall margin for engine starting, acceleration and part power operation.

B. The four variable vane stages are contained in the split HPC front case that is bolted together during assembly. The case is made of titanium and has a steel fire liner at Stages 6 and 7.
The outer trunnion of each vane is mechanically attached through the HPC front case to a synchronizing ring assembly for each stage. The four synchronizing ring assemblies are then linked to a stator vane actuator controlled by the electronic engine control. The vanes are automatically adjusted to provide adequate stall margin for engine starting, acceleration and part power operation. Attached to the ID of the vanes are abradable rubstrips axially aligned with knife-edge seals on the drum rotor. Attached to the ID of the HPC front case are abradable rub-strips axially aligned with the Stages 5, 6 and 7 blade tips.





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Compressor Variable Stator Vane Actuation
Figure 001

R 1. In-situ Blend Repair of HPC Rotor Blades (Stages 5-15)

R A. Procedure

CAUTION : EXCEPT FOR WORK OR SUPPLIES TO BE PERFORMED OR FURNISHED BY
R PRATT & WHITNEY, PRATT & WHITNEY DOES NOT ENDORSE THE WORK PERFORMED BY THE COMPANY OR COMPANIES IDENTIFIED HEREIN OR ANY OTHER COMPANY AND DOES NOT ACCEPT RESPONSIBILITY TO ANY DEGREE FOR THE SELECTION OF SUCH COMPANY OR COMPANIES FOR THE PERFORMANCE OF ANY WORK OR PROCUREMENT OF SUPPLIES.

R (1)The source identified below is approved to do this repair.

Pratt & Whitney Services, Inc.
d.b.a. Dallas Aviation Field Service
400 Main Street
R East Hartford, CT 06108 - 0969 USA

Tel : (860) 565-0140
Fax : (860) 565-5442

R (2)Due to the critical nature of this repair, repair sources must demonstrate to Pratt & Whitney their capabilities to perform this repair and be licensed by Pratt & Whitney. Write to the address below about the qualification program to become an approved and licensed source.

R Pratt & Whitney, A United Technologies Company
R Manager, Joint Ventures, Partnerships and Licensing
R 400 Main Street, Mail Stop 133-58
R East Hartford, CT 06168 USA
R E-Mail :gppwlicng pw.utc.com
R E-Fax : (860) 557-7197

5TH STAGE SYNCHRONIZING RING ASSEMBLY - APPROVED REPAIRS

1. Repair Vane Arm Rivet Pin Cracked Tack Welds

A. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedures	
(1) Material No. P09-014	Sealants (Ref. 70-00-00)
(2) Material No. P11-014A	Cleaning Agents (Ref. 70-00-00)

B. Procedure (Ref. Fig. 801).

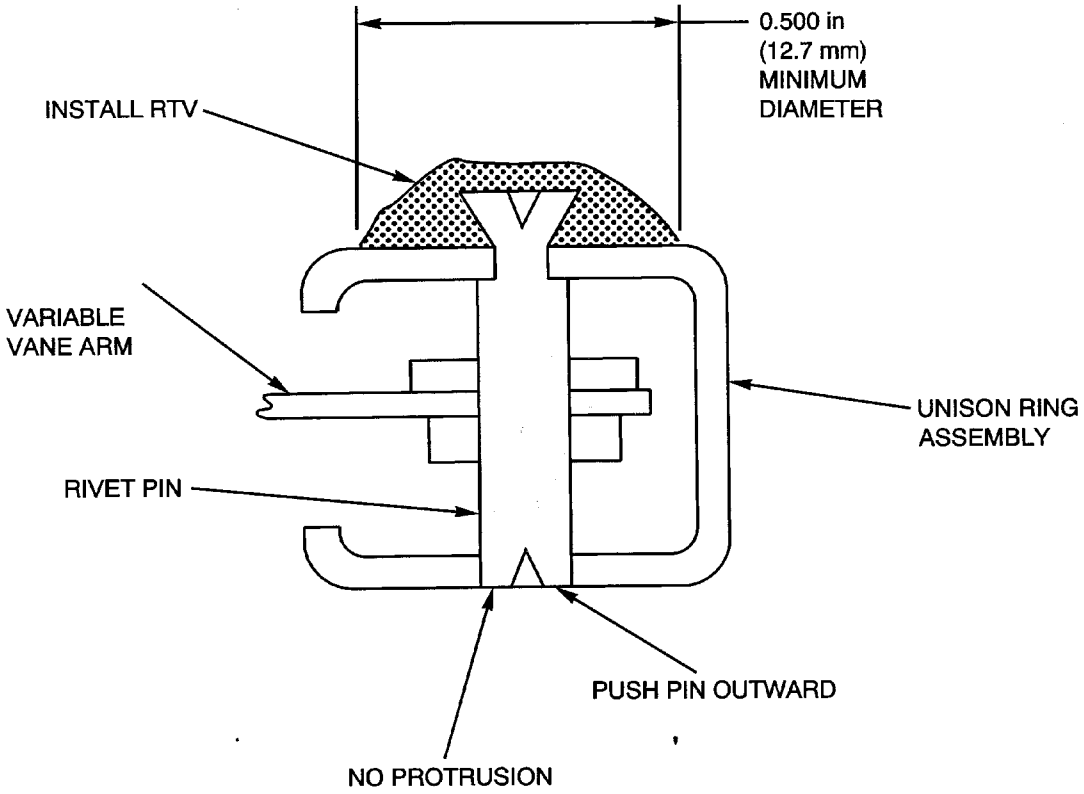
(1)Apply a large amount of Material No. P09-014 to vane arm rivet pin.

(a)Clean rivet pin area with Material No. P11-014A.

(b)Push pin outwards.

(c)Apply Material No. P09-014 as shown.

(d)Wait one hour before engine operation.



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PW V

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Rivet Pin Sealant Application
Figure 801

COMPRESSOR REAR STATOR ASSEMBLY - DESCRIPTION AND OPERATION

1. Description

Eighth through fourteenth stage of the stators are of segmented ring construction with stator vanes brazed in position. Airsealing rings are attached to the inner shroud of each stator assembly and have a stepped inside to match with the knife-edge of the compressor rotor assembly.

COMPRESSOR REAR FRAME ASSEMBLY - DESCRIPTION AND OPERATION

The compressor rear frame assembly consists of compressor case and diffuser case.

1. Compressor Case (Ref. Fig. 001)
   The compressor case houses the compressor and provides 8th, 9th and 15th air bleed ports for engine and aircraft service.

   A. Customer bleed connections are provided at the 8th stage to satisfy aircraft pneumatic requirements. Twelfth stage air is delivered to a fan duct heat exchanger where the air is cooled prior to being delivered to the No.3 bearing compartment to maintain a cool environment in that area. Twelfth stage air is also delivered to the high pressure turbine (HPT) to provide cooling for the 2nd stage turbine vanes and 2nd stage turbine blades.

   B. The 9th stage air bleed is overboarded by the FADEC through two bleeds during engine starting and shut down. One of the two bleeds is also used for engine surge protection purposes.

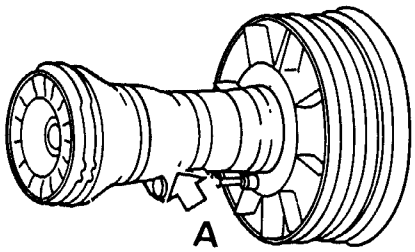
2. Diffuser Case (Ref. Fig. 001, 002)

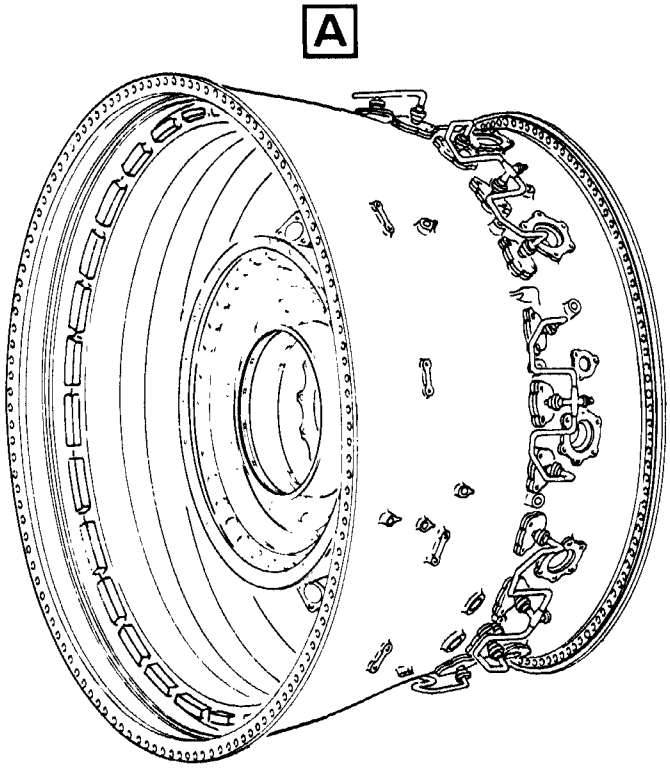
   A. The diffuser case is a main structural element for the engine, supporting the No.3 bearing and rear of the high pressure rotor system. The case is a housing for all of the detail parts of the diffuser and combustor section. The outer wall of the case is separated from the outer contour of the diffused (expanded) gaspath by a conical support. This outer wall also contains mounting provisions for the externally removable fuel injectors and the two igniter plugs.

   B. Eight removable plugs in the outer wall of the case provide access for borescope inspection of the compressor exit stator vanes, combustion chamber liners, fuel injectors, stage 1 HPT vane cluster assemblies, and stage 1 HPT blades. Four mounting bosses are provided for connecting to the aircraft pneumatic (service bleed) system.

   C. The inner structure of the case is supported by twenty four integrally cast hollow struts at the forward end. This structure consists of the wall which forms the inner contour of the diffused gaspath and the attachment flange for the No.3 bearing. The structure provides radial load carrying support for the bearing compartment through the struts.

   D. The hollow struts provide radial passages across the gaspath for oil supply, breather, and scavenge tubes and for tubes supplying cooling air to the No.3 bearing compartment and the high pressure turbine.





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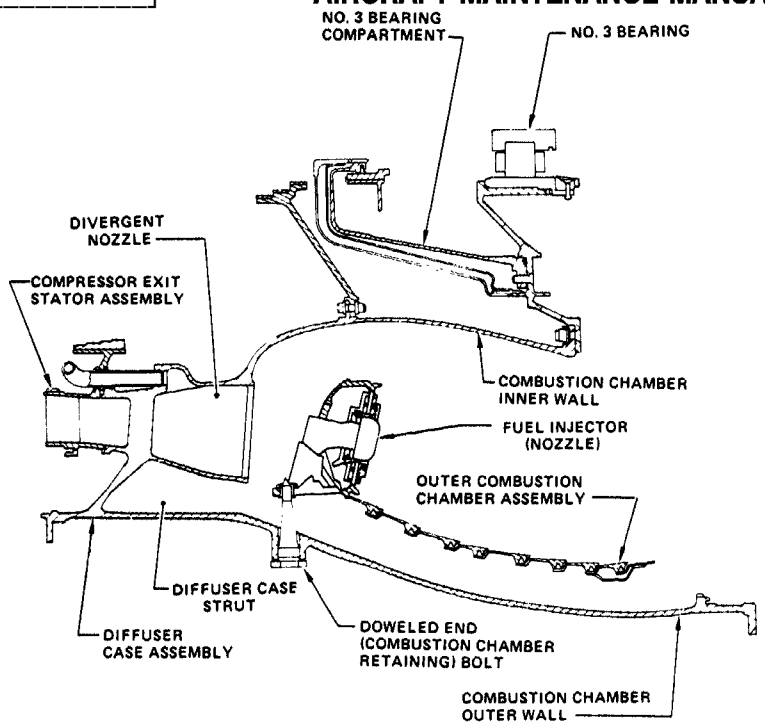
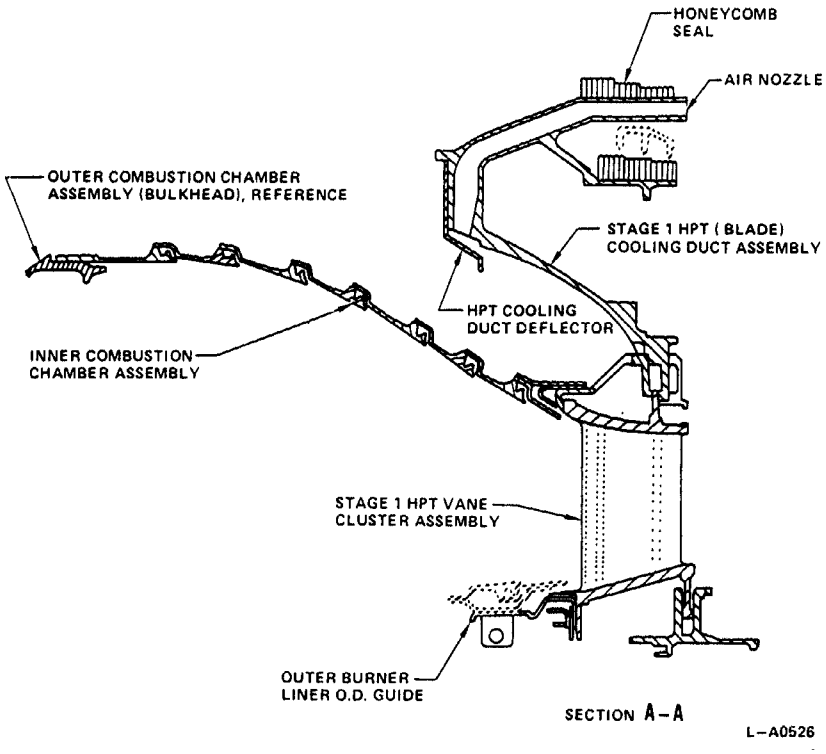
Diffuser and Combustor
Figure 001




HONEYCOMB SEAL
AIR NOZZLE
OUTER COMBUSTION CHAMBER ASSEMBLY (BULKHEAD), REFERENCE
STAGE 1 HPT (BLADE) COOLING DUCT ASSEMBLY
HPT COOLING DUCT DEFLECTOR
INNER COMBUSTION CHAMBER ASSEMBLY
STAGE 1 HPT VANE CLUSTER ASSEMBLY
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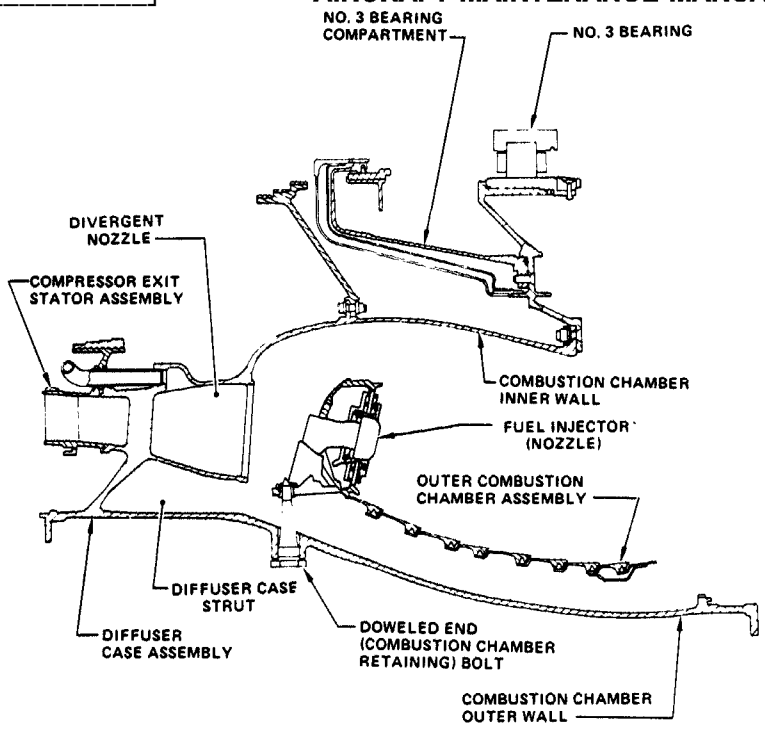
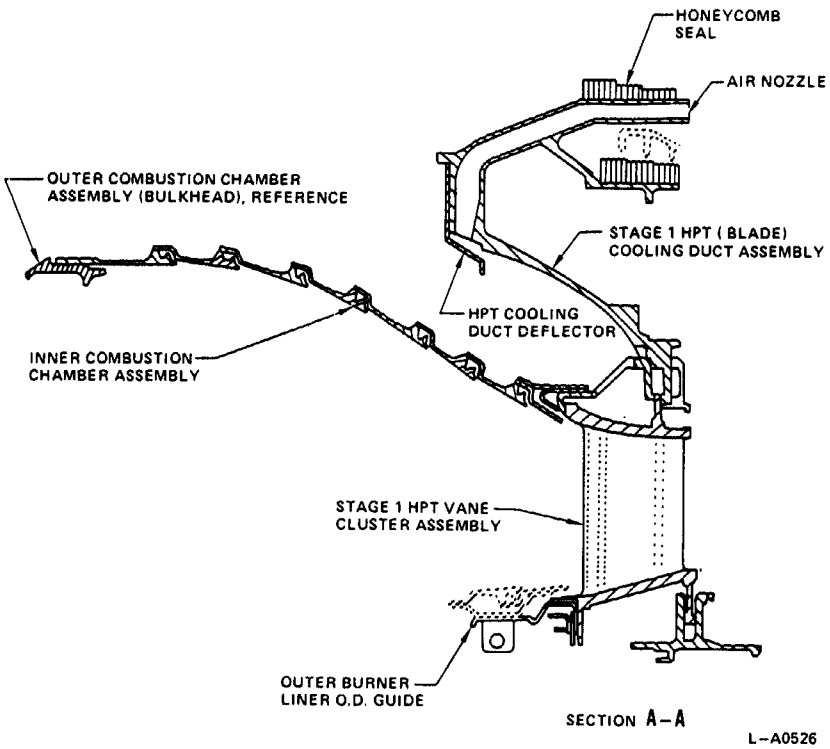
Diffuser Case Cross Section
Figure 002

COMBUSTION SECTION - DESCRIPTION AND OPERATION

1. Description (Ref. Fig. 001)
   The combustion chamber installed in the diffuser case forms the enclosure where the combustion of fuel takes place. The controlled release of energy of combustion through the turbine nozzles drives the engine rotors, HP rotor for self sustaining operation and LP rotor to develop airflow through the fan exhaust nozzle. It also provides a surplus of gases to eject through the core engine exhaust nozzle for additional thrust.




HONEYCOMB SEAL
AIR NOZZLE
OUTER COMBUSTION CHAMBER ASSEMBLY (BULKHEAD), REFERENCE
STAGE 1 HPT (BLADE) COOLING DUCT ASSEMBLY
HPT COOLING DUCT DEFLECTOR
INNER COMBUSTION CHAMBER ASSEMBLY
STAGE 1 HPT VANE CLUSTER ASSEMBLY
OUTER BURNER LINER O.D. GUIDE
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Diffuser - Burner
Figure 001

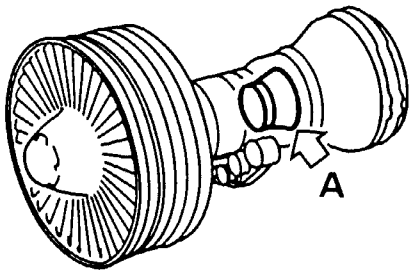
COMBUSTION LINER ASSEMBLY - DESCRIPTION AND OPERATION

1. Description (Ref. Fig. 001, 002)

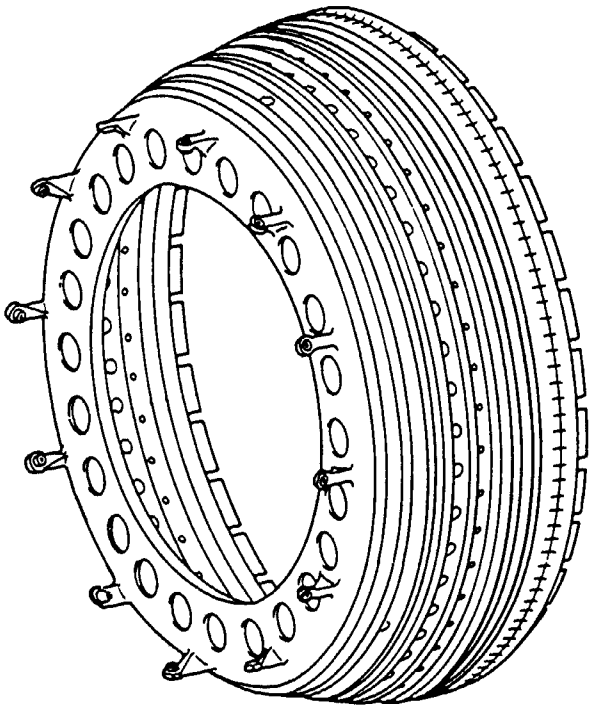
A. The combustion chamber assemblies are fabricated in two sections. The inner combustion chamber (liner) assembly is a part of the turbine nozzle section for assembly purposes. The outer combustion chamber (liner) assembly is a part of this diffuser and combustor section. The two combustor chamber assemblies form a short double pass flow type burner utilizing a welded rolled ring construction for the liner sections and a cast forward bulkhead. The inner surfaces which are exposed to combustion gasses are coated with a magnesium zirconate material as a thermal barrier protection.

B. The outer chamber is retained to the outer wall of the diffuser case at the forward end by twelve doweled end bolts.
The rear of the chamber is positioned and retained to the turbine nozzle by a guide and circumferential clamp assembly. The guide and clamp assembly is adjusted during assembly to provide a slip-fit sealing feature with the outer diameter of the combustion chamber.

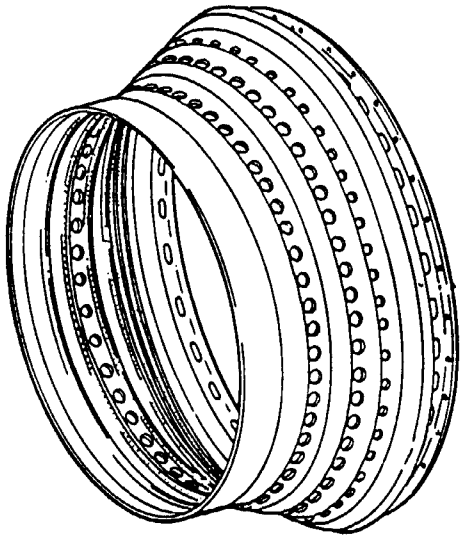
C. The combustion chamber provides mixing of the fuel from the fuel injectors with the proper amount of air for optimum combustion. Combustion of the fuel is contained within the forward and middle section of the chamber, rearward of the fuel injector nozzles. The rear portion of the chamber allows for complete mixing of the remaining airflow with the hot combustion gases and for the transition to the turbine nozzle.



A



COMBUSTION CHAMBER
OUTER LINER



COMBUSTION CHAMBER
INNER LINER

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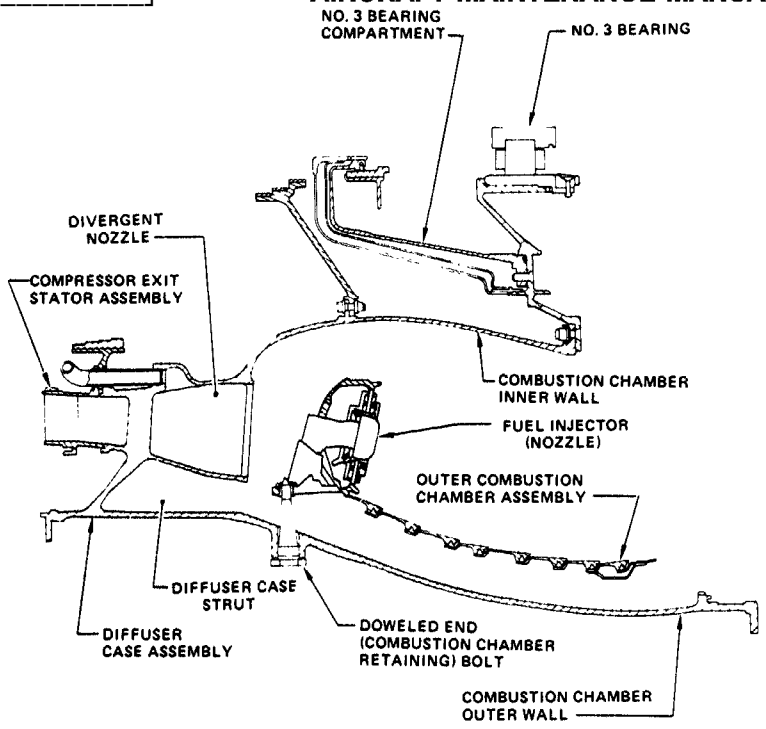
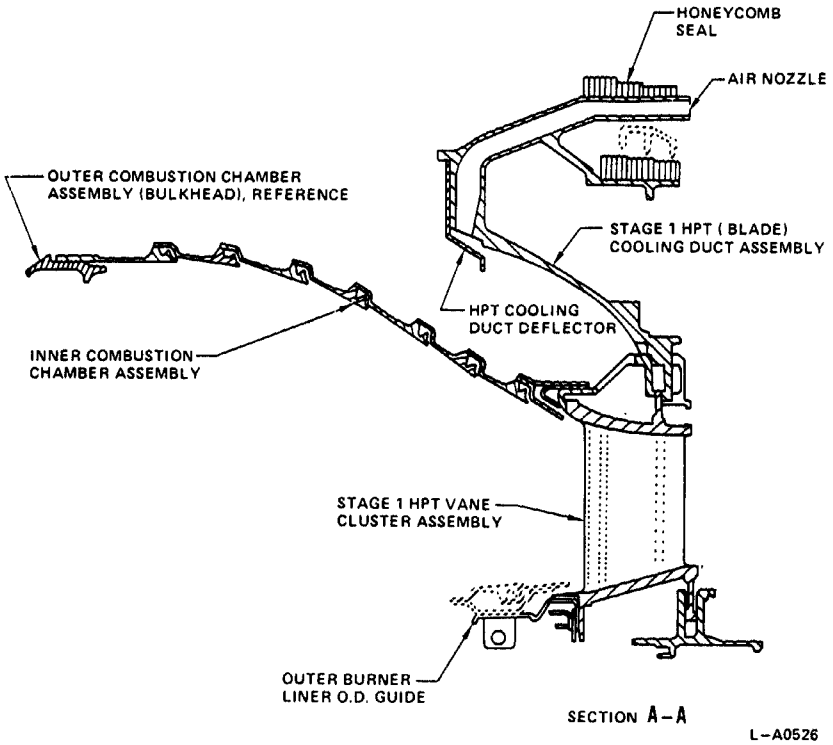
Combustion Section
Figure 001




HONEYCOMB SEAL
AIR NOZZLE
OUTER COMBUSTION CHAMBER ASSEMBLY (BULKHEAD), REFERENCE
STAGE 1 HPT (BLADE) COOLING DUCT ASSEMBLY
HPT COOLING DUCT DEFLECTOR
INNER COMBUSTION CHAMBER ASSEMBLY
STAGE 1 HPT VANE CLUSTER ASSEMBLY
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Diffuser Burner
Figure 002

DIFFUSER CASE ASSEMBLY - APPROVED REPAIRS

1. Equipment and Materials

ITEM	DESIGNATION
A.	Heli-Coil Insert Installation Tool (535-9)
B.	Heli-Coil Insert Extracting Tool (1227-16)
C.	Heli-Coil Thread Plug Gage (1694-9)
D.	Heli-Coil Tap (38193-9)
E.	Heli-Coil Bottoming Tap (43193-9)
F. PWA81439	Guide, Tap
G. PWA81441	Guide, Reamer
H. PWA81442	Reamer, Special
I. PWA81443	Reamer, Special
Referenced Procedure	
- 71-13-00, P. Block 301	Cowl Doors

2. General

A. Incorporate this repair if, after chasing boss threads with tap, the following cannot be met :
(1)Minimum of four full threads within 0.35 inch (8.89 mm) from Surface A. (Ref. Fig. 801)

B. This repair is done without machining the inside counterbore.

C. The inside counterbore machining procedure must be done when engine is disassembled sufficiently to permit access to inner surface of diffuser case.

3. Procedure (Ref. Fig. 801)
CAUTION : BOSS WALL THICKNESS MUST NOT BE LESS THAN 0.1 INCH (2.54 MM). DRILLING TO A DEPTH GREATER THAN 0.545 INCH (13.843 MM) WILL LIMIT THE CASE LIFE.

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

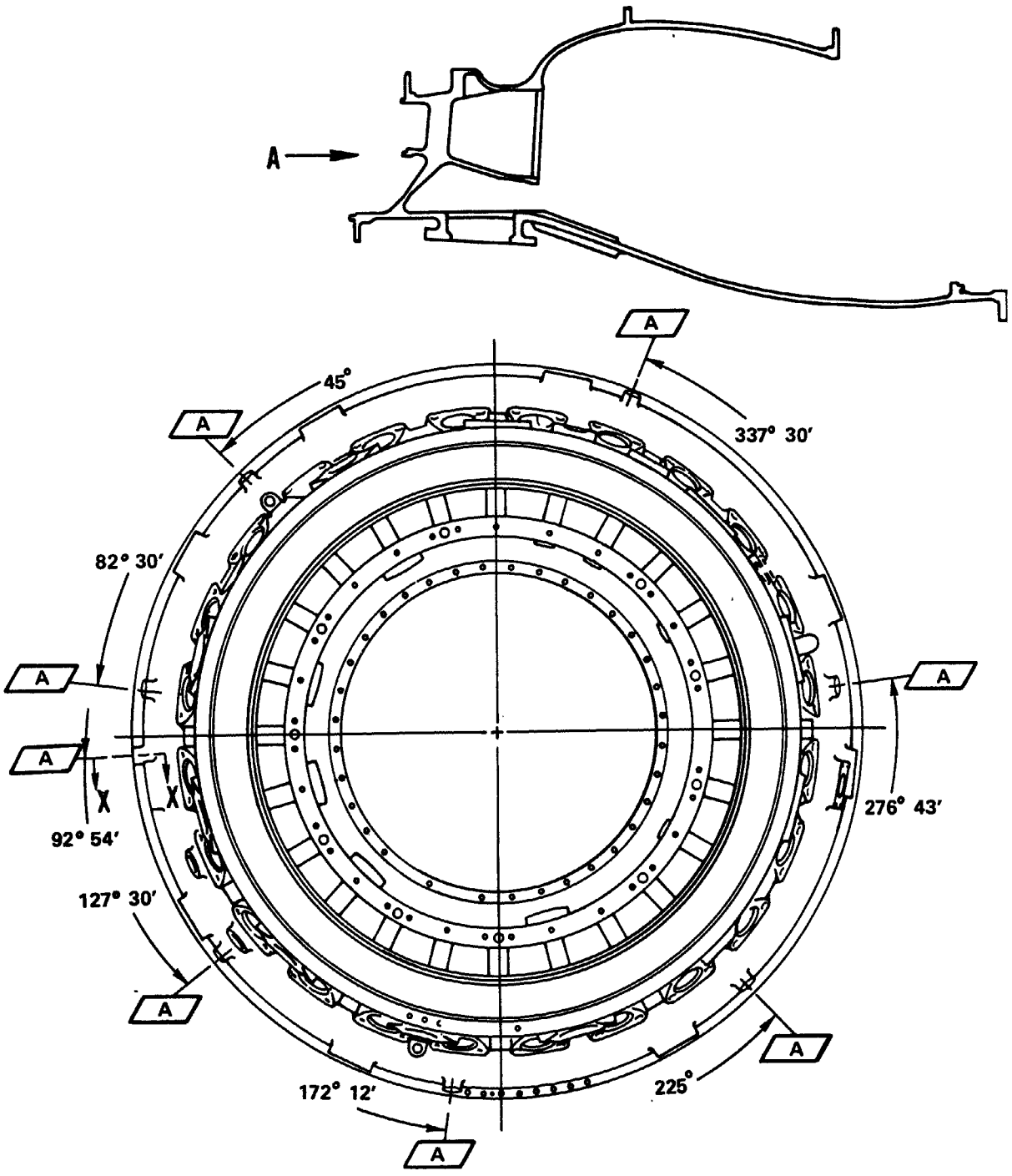
B. Machine damaged threads by means of the following procedure (Ref. Fig. 801).
Machined area must be within 0.01 inch (0.254 mm) diameter of true position of Surface A and original location of damaged thread minor diameter.
(1)Attach standard shop vacuum cleaner to PWA81441 Reamer Guide.
(2)Insert PWA81442 Special Reamer into (PWA81441) Reamer Guide.
(3)With standard electric drill, machine damaged threads.
(4)Remove (PWA81442) Special Reamer from (PWA81441) Reamer Guide and install PWA81443 Special Reamer into guide.
(5)With standard electric drill, machine damaged threads.

C. Tap boss by means of the following procedure (Ref. Fig. 801).
(1)Attach standard shop vacuum cleaner to PWA81439 Tap Guide.
(2)Insert 38193-9 Tap into (PWA81439) Tap Guide.
Rough tap boss.
(3)Remove (38193-9) Tap from (PWA81439) Tap Guide and install 43193-9 Bottoming Tap into guide.
(4)Tape boss. Remove all chips.

D. Check threads with 1694-9 Thread Plug Gage.

E. Install insert into boss as follows :
(1)With insert installed in 535-9 Inserting Tool, put tip of inserting tool into boss.
(2)Turn handle of inserting tool clockwise until top of insert is 3/4 to 1 1/2 pitch below boss face.
NOTE : Insert can be removed with 1227-16 Extracting Tool.
(3)Break off insert tang with long nose pliers.

F. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).
(3)Remove safety clips and tags and close circuit breakers.
(4)Remove access platform.



VIEW IN DIRECTION A

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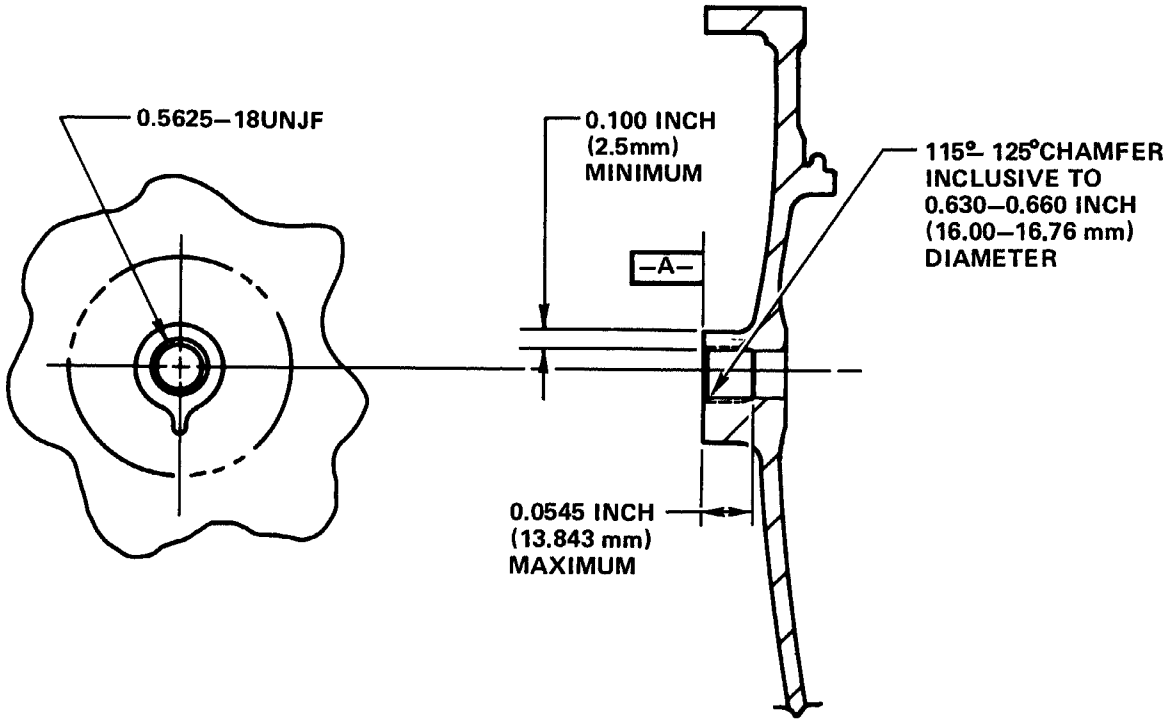
Borescope and Thermocouple Boss Threads (Sheet 1/2)
Figure 801



SECTION X–X

(TYPICAL OF BOSS AT LOCATIONS A)

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Borescope and Thermocouple Boss Threads (Sheet 2/2)
Figure 801

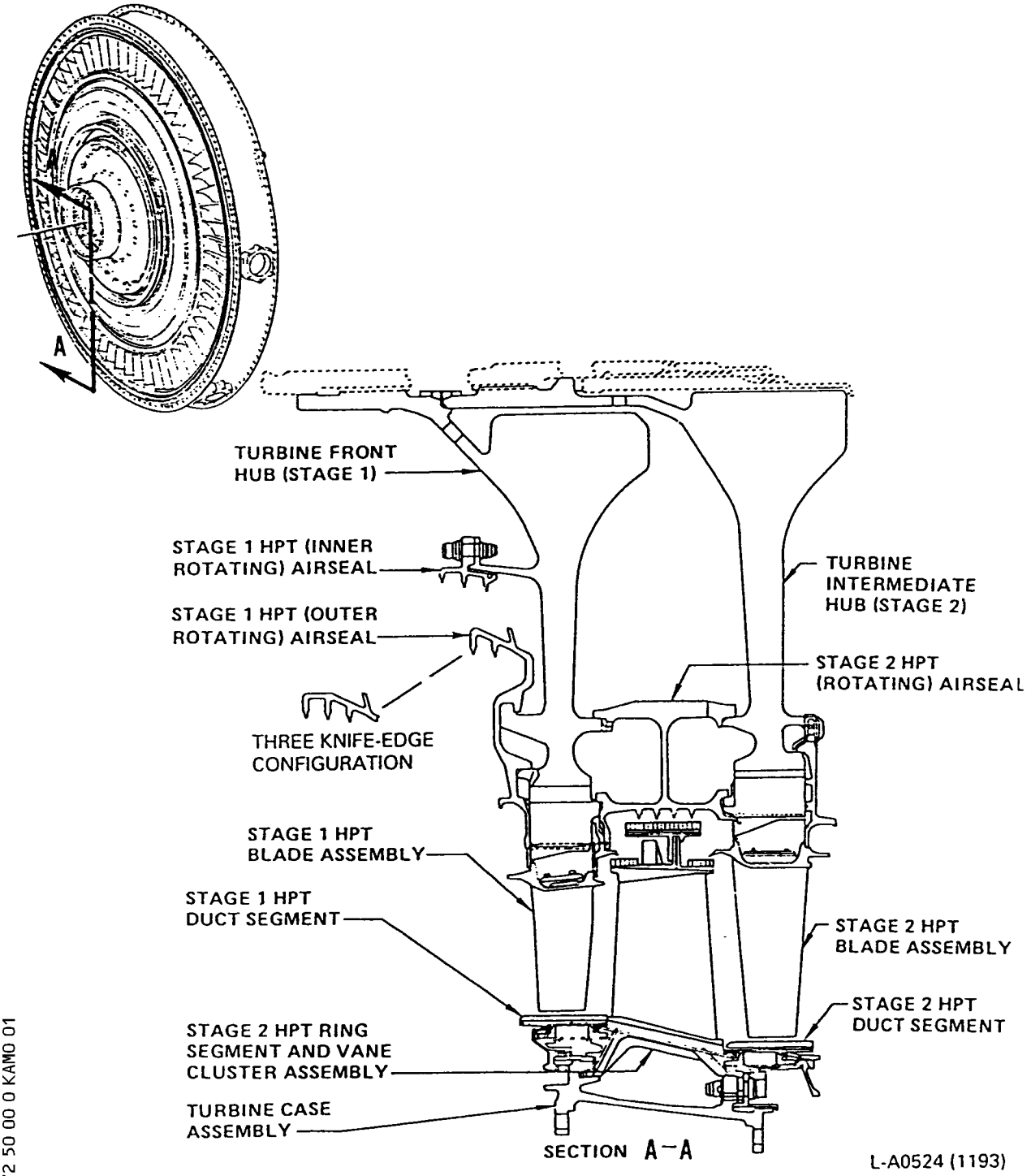
TURBINE SECTION - DESCRIPTION AND OPERATION

1. Description (Ref. Fig. 001, 002, 003)
(Ref. Fig. 004)

The turbine section includes two modules rear and front compressor drive turbines.

A. The rear compressor drive turbine is a two stage high pressure turbine which converts a portion of the heat energy contained in the combustion gases into mechanical energy to drive the rear compressor rotor.
The two stage rear compressor drive turbine rotor and stator assembly is housed within the front turbine case.

B. The front compressor drive turbine is a four stage low pressure turbine which converts a portion of the energy contained in the combustion gases into mechanical energy to drive the fan assembly.
The front compressor drive turbine is located within the rear turbine case, the front flange of which is bolted to the front turbine case, and the rear flange to exhaust case assembly.


A
A
TURBINE FRONT HUB (STAGE 1)
STAGE 1 HPT (INNER ROTATING) AIRSEAL
STAGE 1 HPT (OUTER ROTATING) AIRSEAL
THREE KNIFE-EDGE CONFIGURATION
STAGE 1 HPT BLADE ASSEMBLY
STAGE 1 HPT DUCT SEGMENT
STAGE 2 HPT RING SEGMENT AND VANE CLUSTER ASSEMBLY
TURBINE CASE ASSEMBLY
TURBINE INTERMEDIATE HUB (STAGE 2)
STAGE 2 HPT (ROTATING) AIRSEAL
STAGE 2 HPT BLADE ASSEMBLY
STAGE 2 HPT DUCT SEGMENT
SECTION A-A
L-A0524 (1193)

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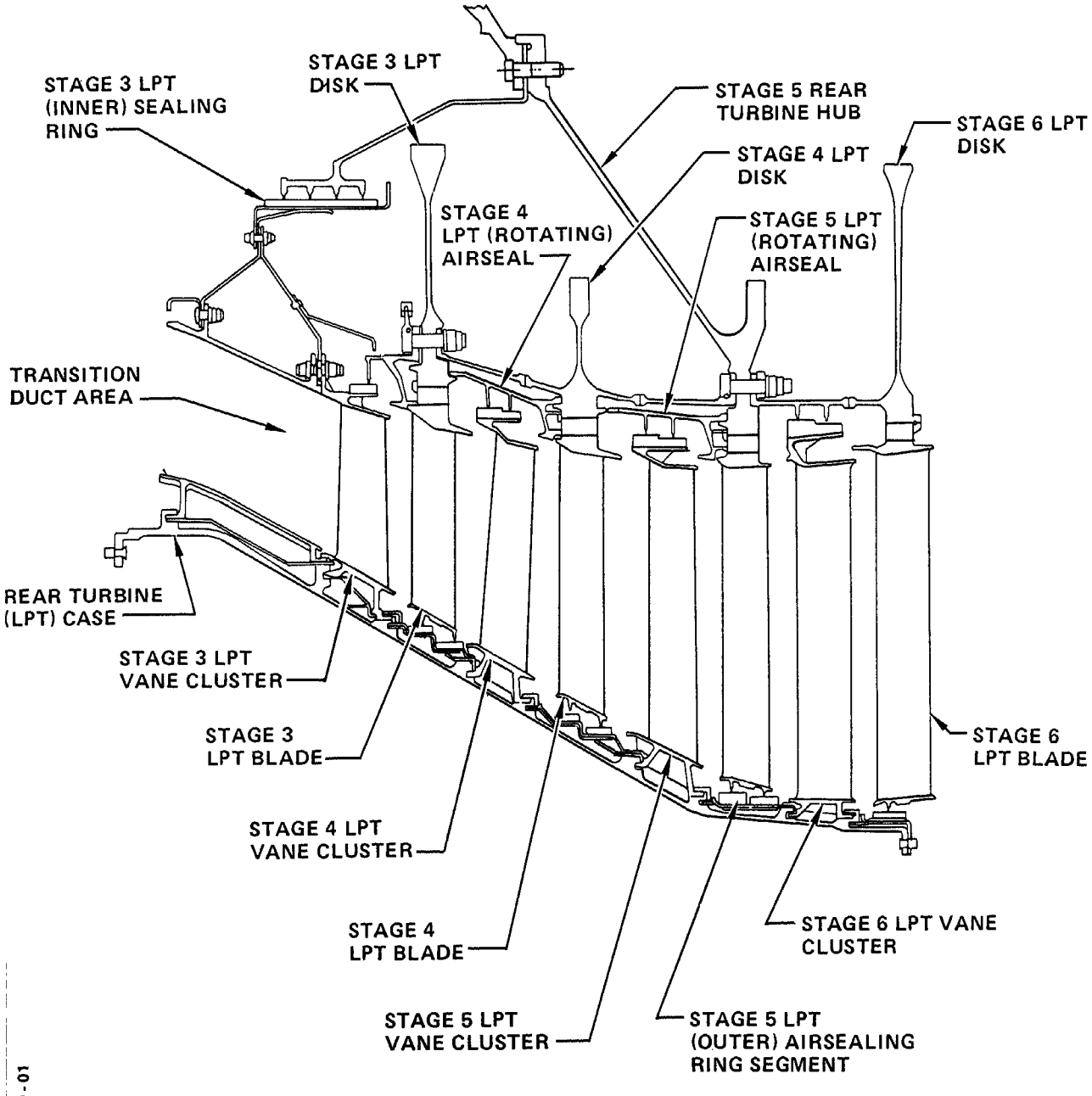
High Pressure Turbine (HPT)
Figure 001


STAGE 3 LPT (INNER) SEALING RING
STAGE 3 LPT DISK
STAGE 5 REAR TURBINE HUB
STAGE 6 LPT DISK
STAGE 4 LPT DISK
STAGE 4 LPT (ROTATING) AIRSEAL
STAGE 5 LPT (ROTATING) AIRSEAL
TRANSITION DUCT AREA
REAR TURBINE (LPT) CASE
STAGE 3 LPT VANE CLUSTER
STAGE 3 LPT BLADE
STAGE 6 LPT BLADE
STAGE 4 LPT VANE CLUSTER
STAGE 4 LPT BLADE
STAGE 6 LPT VANE CLUSTER
STAGE 5 LPT VANE CLUSTER
STAGE 5 LPT (OUTER) AIRSEALING RING SEGMENT
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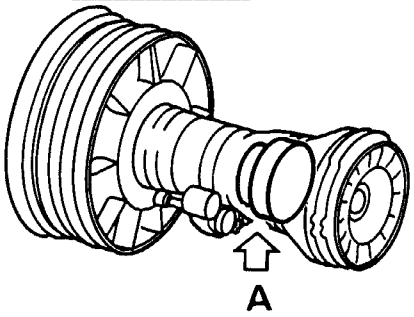
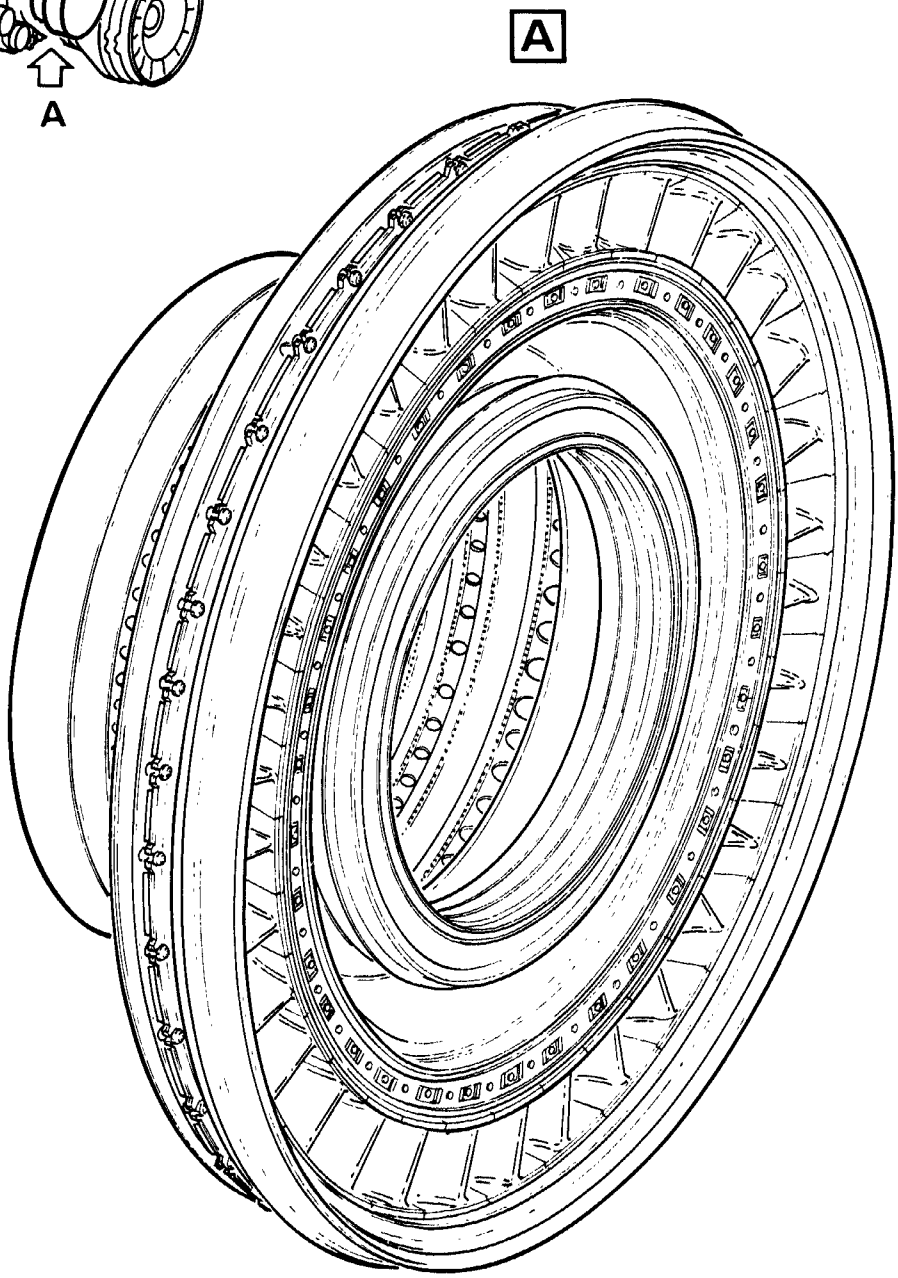
Low Pressure Turbine (LPT)
Figure 002





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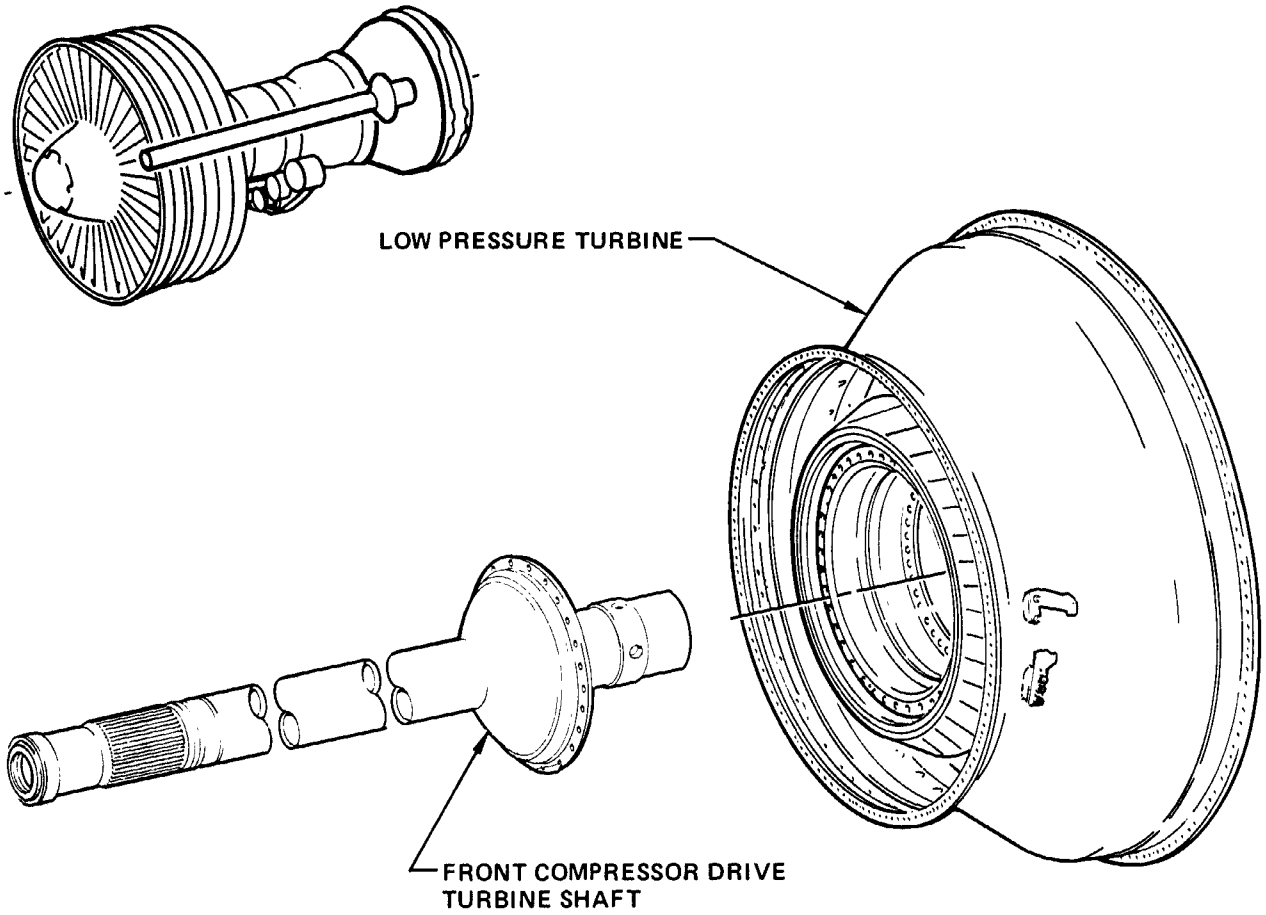
HPT Rotor and Stator Assembly
Figure 003



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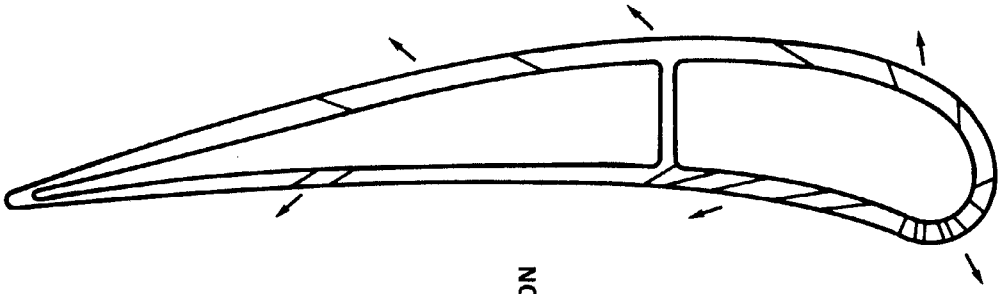
LPT Rotor and Stator Assembly
Figure 004

FIRST STAGE HPT NOZZLE ASSEMBLY - DESCRIPTION AND OPERATION

(Ref. Fig. 001)
The function of the 1st stage HPT nozzle is to direct the hot gases onto the 1st stage turbine blades at the most efficient angle.
The first stage hot nozzle consists of 17 clustered vane assemblies with two vanes per cluster for a total of 34 vanes.
The vanes are cooled by 15th stage air (compressor discharge). Cooling air enters hollow vanes through an opening in each vane inner side, and after cooling the inside of the vane, flows out of the vanes through exit holes and forms a cooling film wrap around the vanes.



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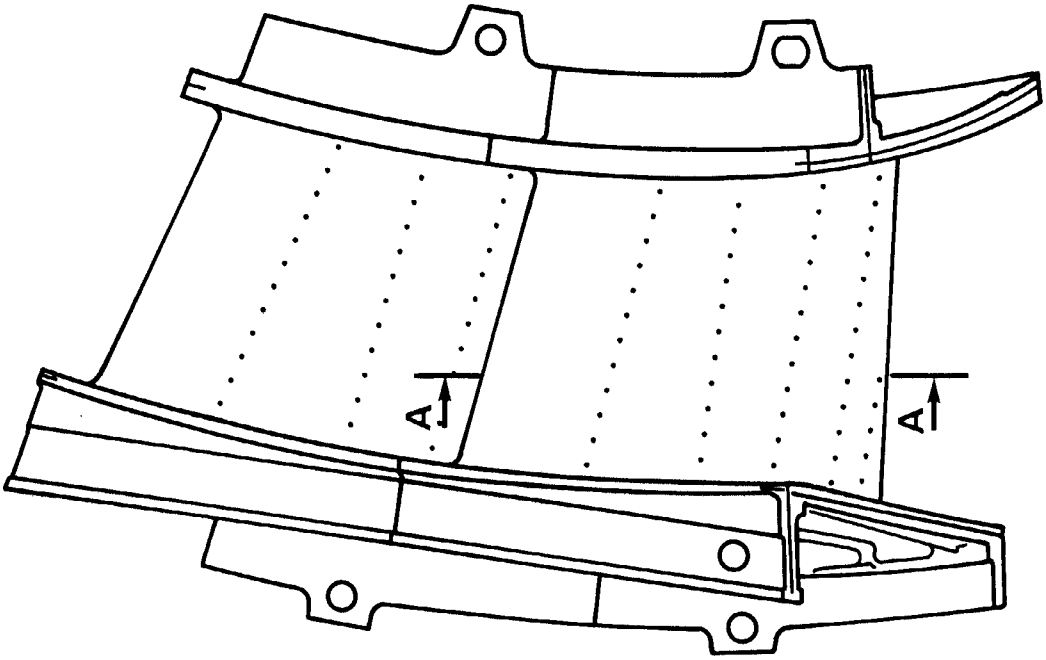

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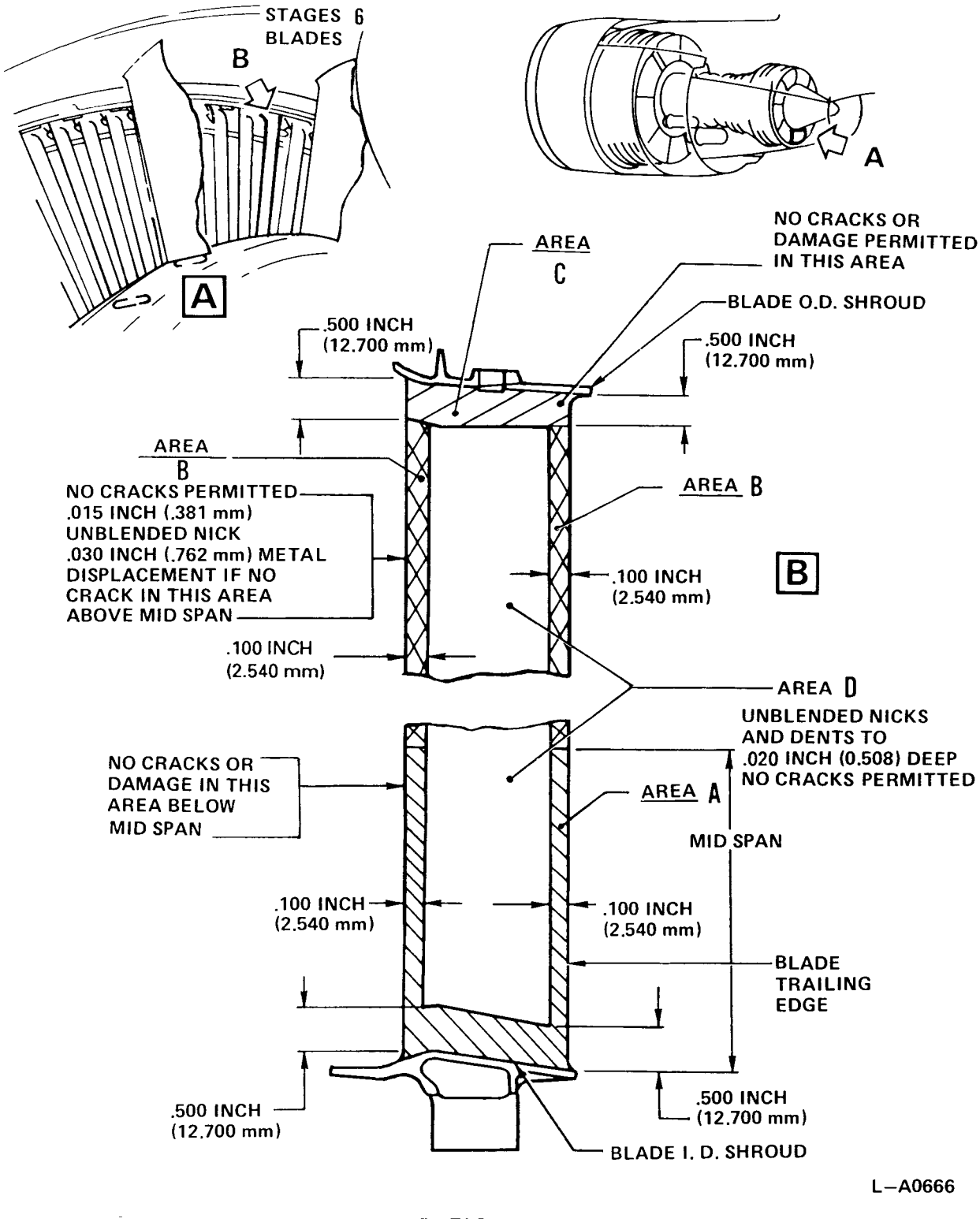
First Stage Turbine Vane
Figure 001

1. 6th Stage Turbine Blade Inspection (Ref. Fig. 601)

A. Inspect 6th stage turbine blades for damage as per limits given in referenced figure.
NOTE : Inspection of 6th stage turbine blades is accomplished by looking forward through turbine exhaust area.



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Stage 6 Turbine Blade Foreign Object Damage Limits
Figure 601

TURBINE STATOR VANE, STAGE 6 - INSPECTION/CHECK

1. 6th Stage Turbine Vane Inspection (Ref. Fig. 601)

A. Equipment and Materials

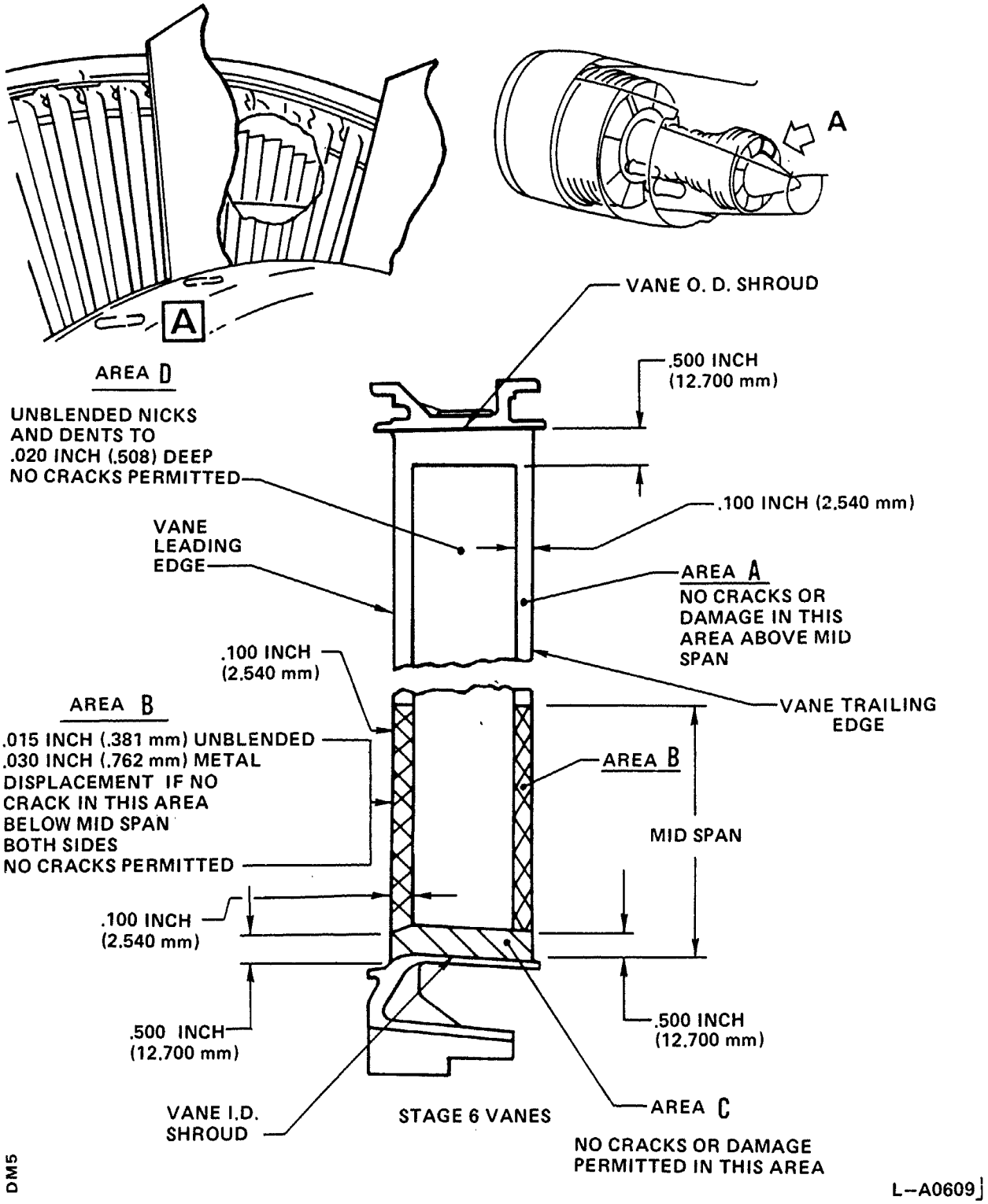
ITEM	DESIGNATION
Referenced Procedure - 72-00-00, P. Block 601	Engine - General

B. Inspect 6th stage turbine vanes for damage as per limits given in referenced figure.

NOTE : Inspection of 6th stage turbine vanes is accomplished by locking forward through turbine exhaust area.

(1) Inspect the visible areas of the vane trailing edge, shrouds and airfoil for damage. See Areas A, B, C and D (Ref. Fig. 601).

NOTE : Only one airfoil side, shrouds and trailing edge are visible. If damage is present on the visible areas of the vane, a complete inspection of the vane should be accomplished. This should be done utilizing a borescope, mirrors or other necessary tooling to observe the vane leading edge and remainder of the airfoil surfaces (Ref. 72-00-00, P. Block 601).



Stage 6 Turbine Vane Foreign Object Damage Limits
Figure 601

STAGE 6 LPT (OUTER) AIRSEALING RING SEGMENT ASSEMBLY-INSPECTION/CHECK

1. Equipment and Materials

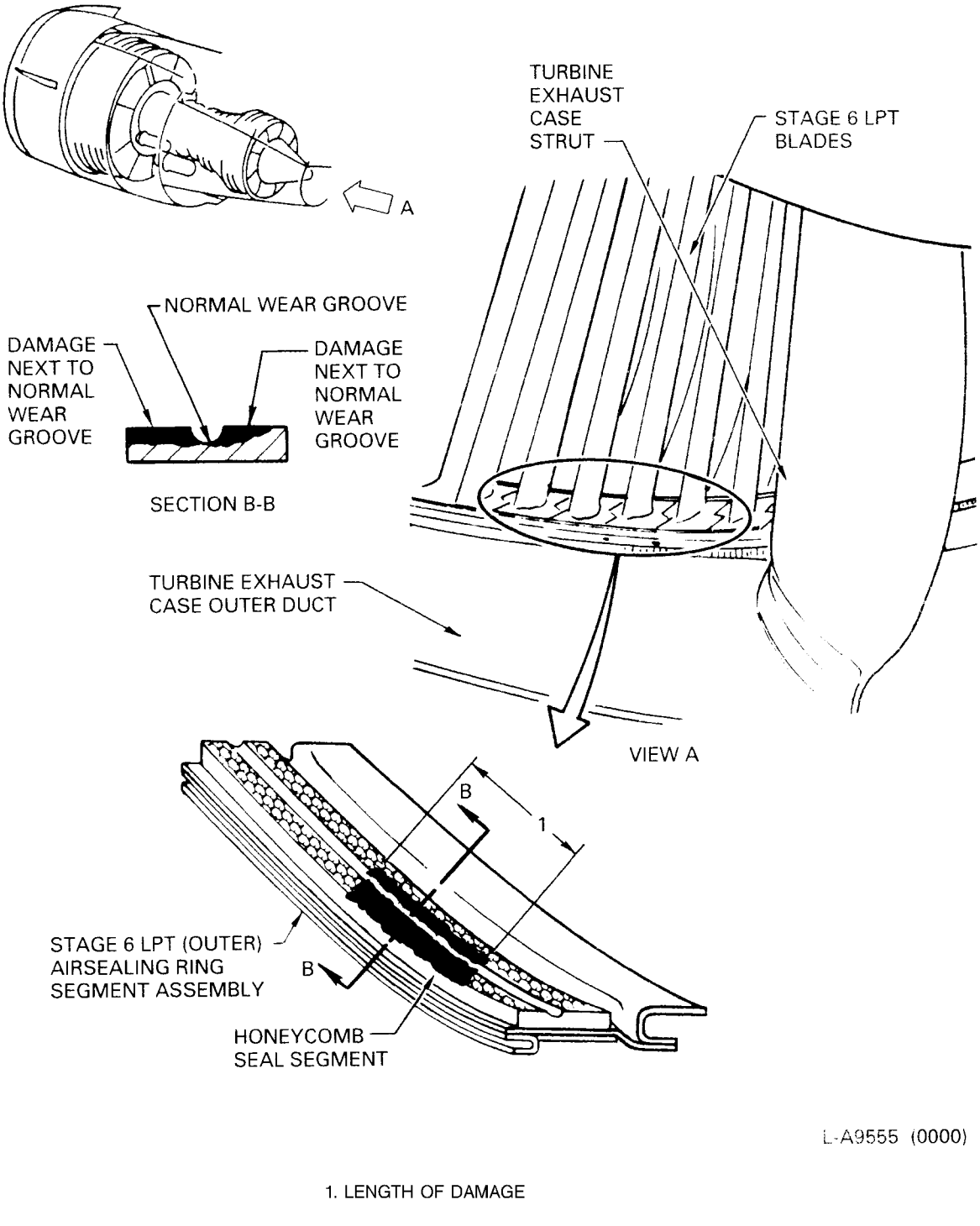
ITEM	DESIGNATION
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

1. Inspect Stage 6 LPT (Outer) Airsealing Ring Segment Assembly (Ref. Fig. 601)

A. Job Set-Up
(1) Open, safety and tag the circuit breakers for the appropriate engine. Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Make an inspection of the stage 6 LPT (outer) airsealing ring segment assemblies.
(1) Damage that is next to, the wear groove and is greater than 3 in. (76.2 mm) in length in each segment, unlimited segments, is not permitted.
NOTE : Make inspection of stage 6 LPT (outer) airsealing ring segment assemblies by looking forward through turbine exhaust case.
NOTE : An increase in segment damage will show a decrease in performance.
(2) If it is necessary to remove the airsealing ring, remove the engine.

C. Close-Up
(1) Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2) Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers for the appropriate engine.



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1. LENGTH OF DAMAGE

Stage 6 LPT (Outer) Airsealing Ring Segment Assembly Inspection
Figure 601

LPT BORESCOPE PORT - APPROVED REPAIRS

1. Reposition/Reoperate LPT Outer Transition Duct Heatshield

A. General

(1)This procedure supplies instructions for the repositioning or reoperation of the LPT outer transition duct heatshield. If the heatshield is ground, it will cause damage to the heatshield which will require repair or replacement at overhaul.

B. Equipment and Materials

ITEM	DESIGNATION
A.	File
B.	Grinder
Reference Procedures	
- 71-13-00, P. Block 301	Cowl Doors
- 72-00-00, P. Block 601	Engine - General

C. Job Set-Up

(1)Open the left fan and thrust cowl doors (Ref. 71-13-00, P. Block 301).

D. Procedure

(Ref. Fig. 801, 802, 803)

(1)If necessary, remove the AP-10 borescope plug (Ref. 72-00-00, P. Block 601).

(2)Visually examine the LPT access port AP-10 to make sure that the outer transition duct heatshield is in the correct position. (Ref. Fig. 803)

(3)If the outer transition duct heatshield is not in the correct position and has moved into the plane of the borescope hole or path of the borescope plug, put the heatshield in the correct position as follows : (Ref. Fig. 802, 803)

(a)Put a small diameter drift or bar into the borescope port to the depth of the heatshield.

(b)Carefully move the heatshield into the correct position with the outer transition duct segment borescope hole.

(4)If you are unable to move the heatshield into the correct position, do the steps that follow. If the heatshield moves as (Ref. Fig. 803), install the AP-10 borescope plug (Ref. 72-00-00, P. Block 601).

NOTE : This reoperation will make larger the outer transition duct heatshield borescope hole and or part of the outer transition duct segment borescope hole. This will make necessary repair or possible replacement of these parts at the next overhaul. Small quantities of grinding chips removed from the outer transition heatshield may enter into the engine space. This will not cause damage to engine operation or the gaspath and non-gaspath parts. A heatshield hole made larger will not have unwanted effect on the heatshield or outer transition duct function, other engine parts, or engine operation.

(5)Visually examine the LPT access port AP-10 to find the transition duct

heatshield that blocks the installation of the borescope plug.

CAUTION : DO NOT REMOVE MATERIAL FROM THE OUTER TRANSITION DUCT SEGMENT HOLE, THIS MAY CAUSE THE SEGMENT TO BE SCRAPPED AT THE NEXT OVERHAUL.

(6)Remove material from the transition duct heatshield as follows :

NOTE : Remove only enough material from the heatshield to allow installation of the borescope plug.

(a)Using a small diameter grinder or file, carefully remove unwanted material from the transition duct heatshield.

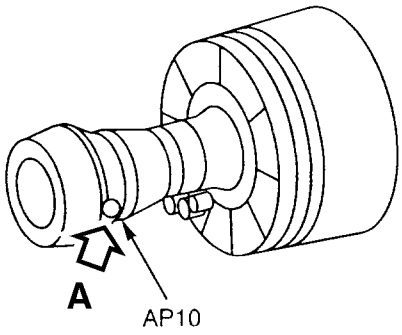
NOTE : Remove only that unwanted material that is necessary to make sure that the heatshield is flush or almost flush with the 0.548 in. (13.919 mm) diameter outer transition duct borescope hole.

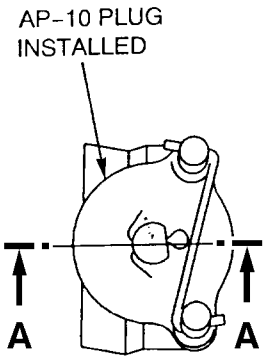
Do not increase the diameter of the borescope hole greater than 0.060 in. (1.524 mm) maximum.

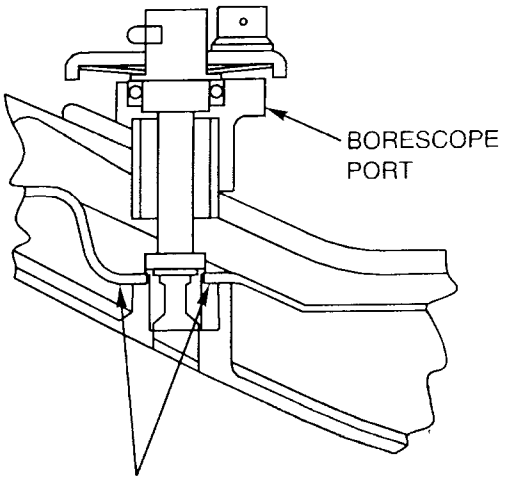
(7)Install the AP-10 borescope plug (Ref. 72-00-00, P. Block 601).

E. Close-Up

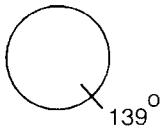
(1)Close the left fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).







SECTION A-A

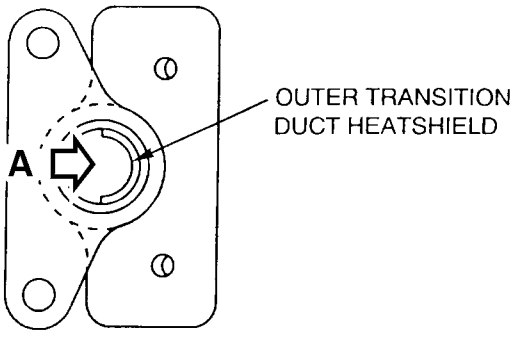


(AP-10)
REAR VIEW SCHEMATIC

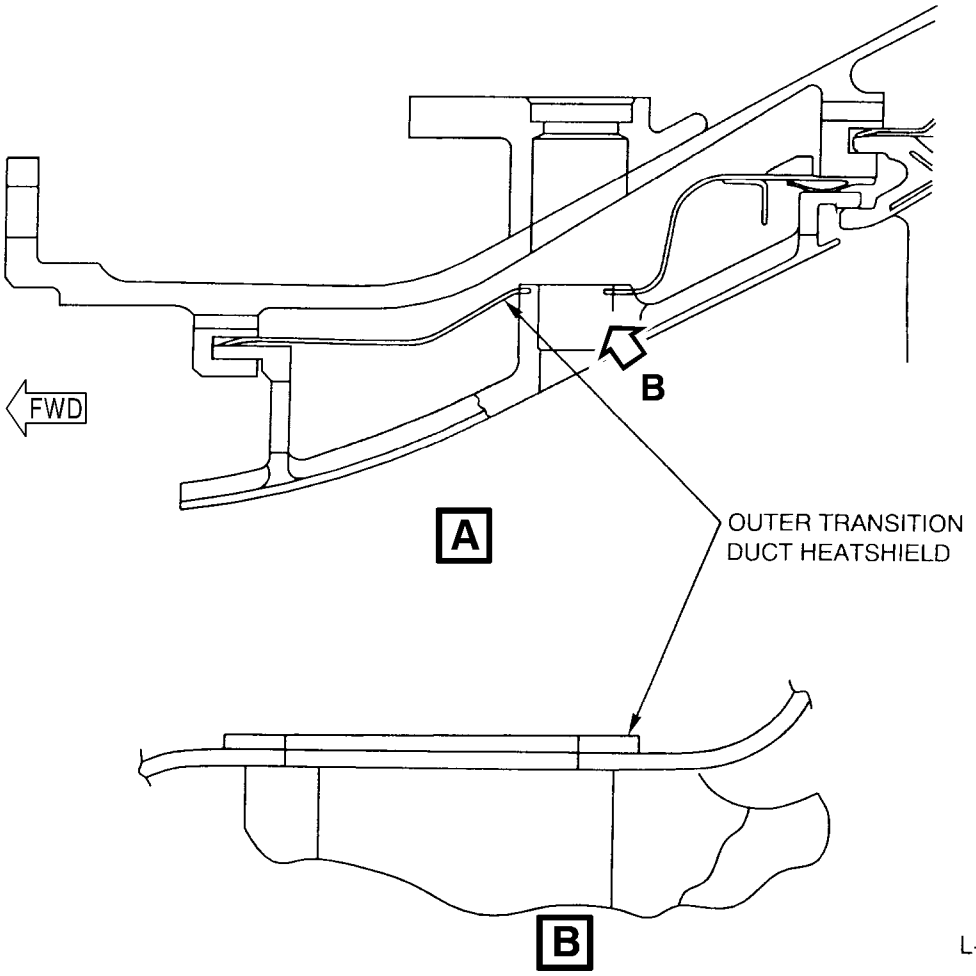
BM5 72 52 04 8 KAM0 00

L-B8650 (0801)
PW V

AP-10 Borescope Access Port
Figure 801



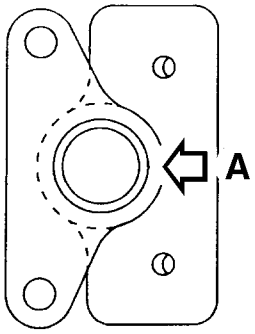
AP-10
BORESCOPE
PORT



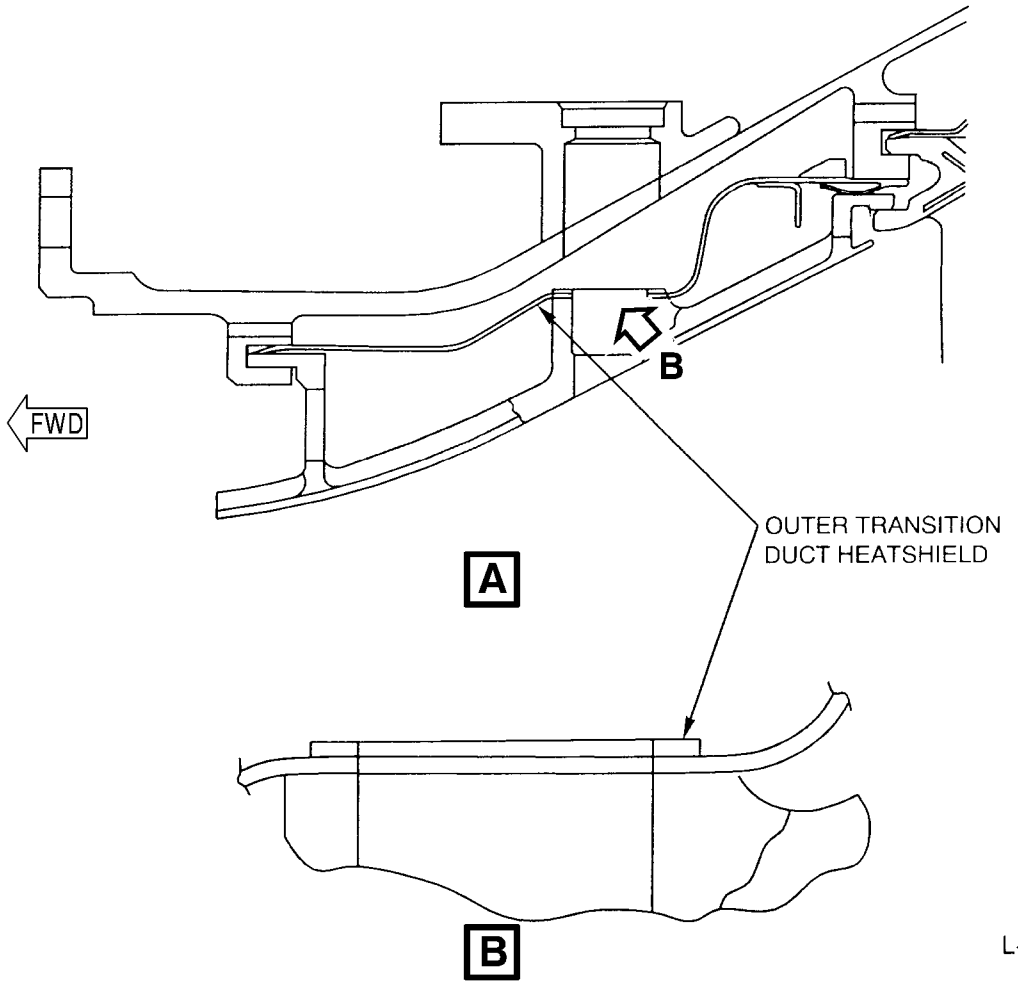
L-B8651 (0801)
PW V

BM5 72 52 04 8 KCM0 00

Heatshield Blocking Access Port
Figure 802



AP-10
BORESCOPE
PORT



BM5 72 52 04 8 KEM0 00

L-B8652 (0801)
PW V

Heatshield In Correct Position
Figure 803

HIGH PRESSURE TURBINE ROTOR ASSEMBLY - DESCRIPTION AND OPERATION

1. General (Ref. Fig. 001, 002)

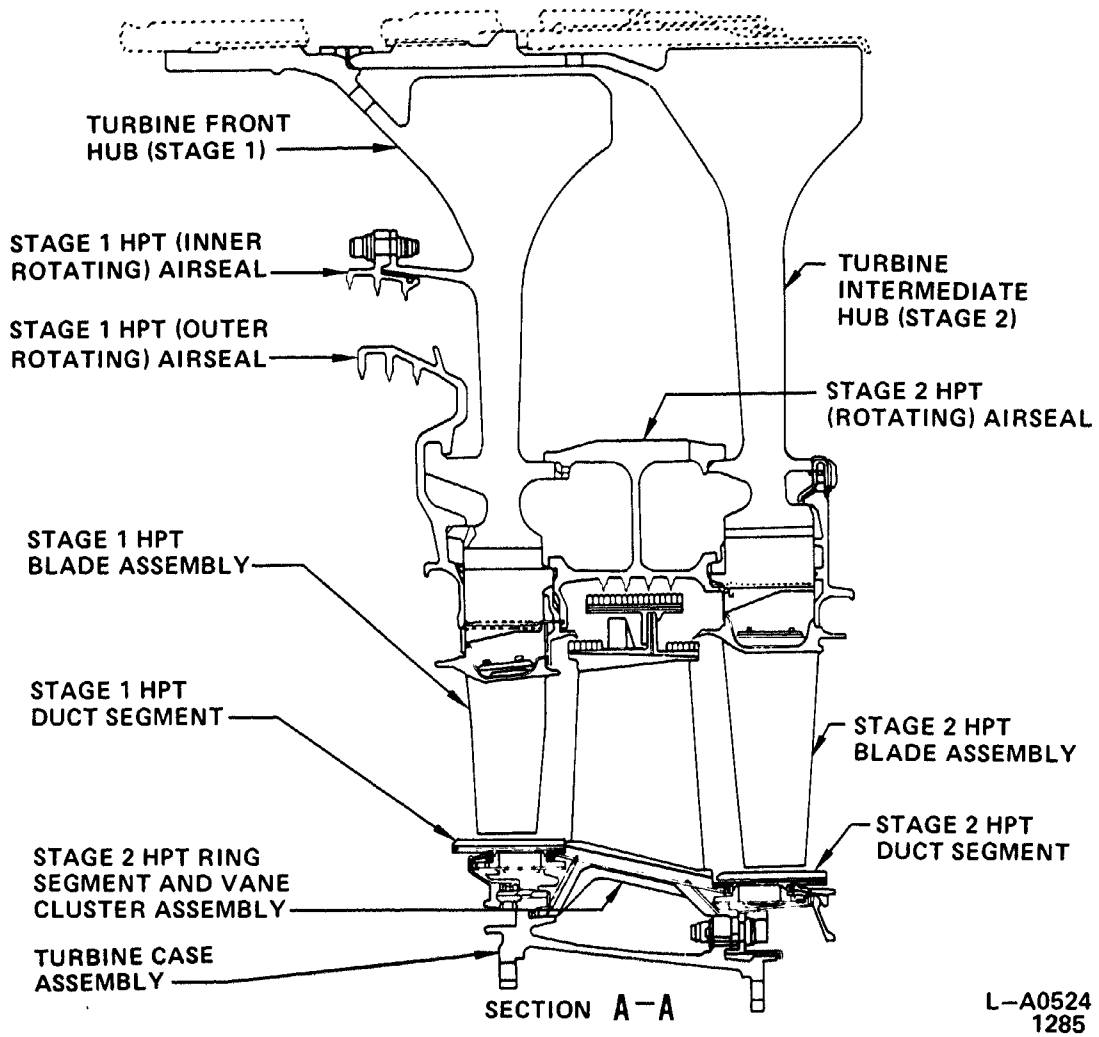
A. The high pressure turbine (HPT) provides the driving force for the high pressure compressor (HPC). The high pressure turbine is located at the rear of the diffuser and combustor and forward of the low pressure turbine (LPT). The high pressure turbine consists of two turbine rotor stages, case and vane assembly and a rotating inner airseal. The turbine rotor assemblies, 2nd stage vanes and inner airseal are air cooled.
The turbine case assembly is also air cooled as part of the automatic turbine rotor clearance control system feature.

B. The 1st stage turbine rotor employs single crystal material blades, which are cooled by air from the diffuser. The cooling air duct nozzles in the turbine nozzle meters cooling air to the blades. The blades are internally air cooled and externally film cooled.

C. The 2nd stage turbine rotor assembly employs directionally solidified blades which are internally cooled by modulated 12th stage compressor air and diffuser air. Cooling air is reduced at cruise for increased performance.

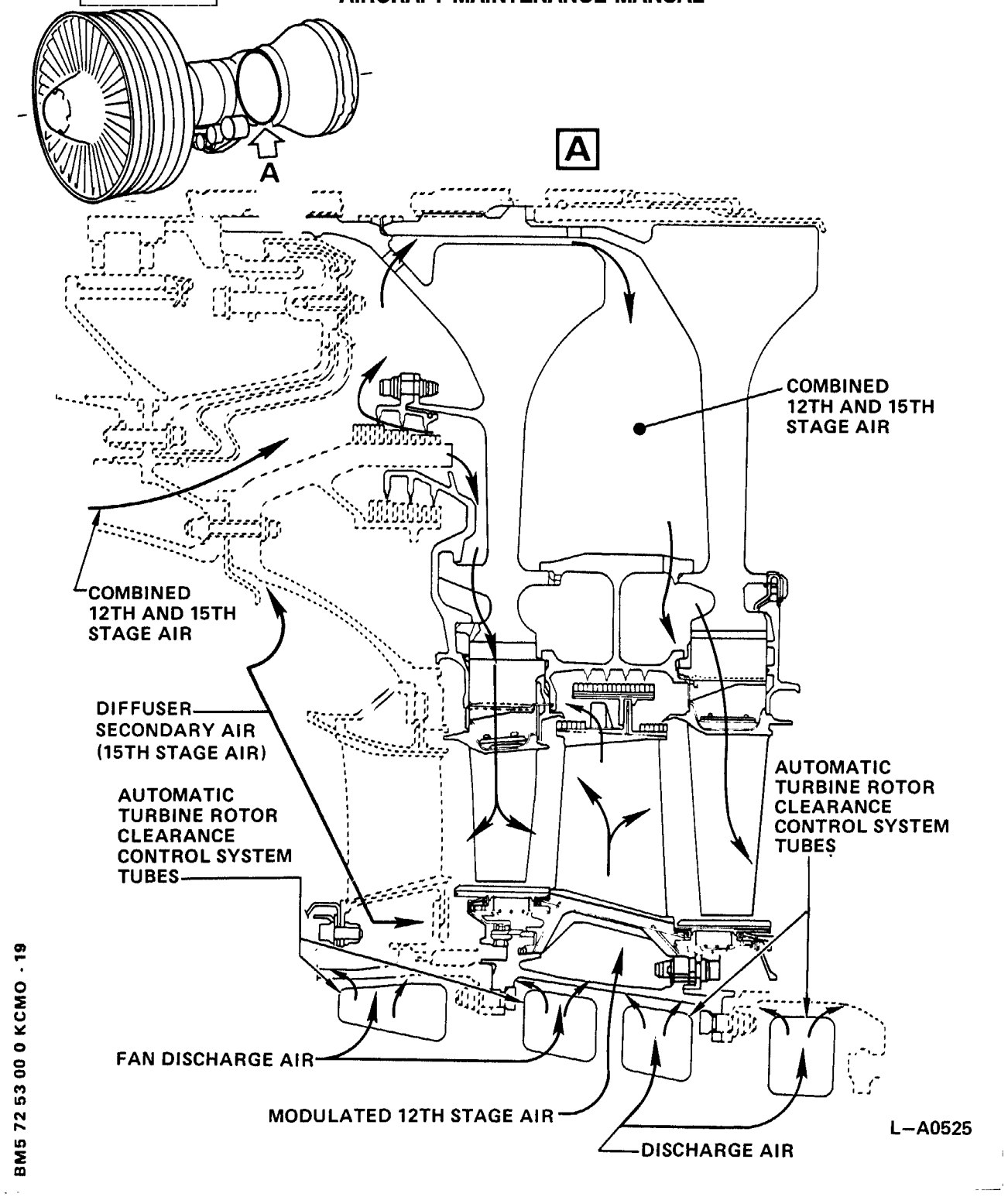
D. The 2nd stage vanes are internally air cooled with modulated compressor air. Cooling air is supplied through four external tubes from the 12th stage compressor bleed location. Two of these tubes contain valves which are closed to reduce cooling air flow at cruise conditions to improve performance. An inner air seal land is located on the ID of the 2nd stage vane clusters and is part of the 2nd stage vane inner seal. This seal is cooled by nozzles, mounted on the ID of the vanes.

E. Automatic turbine rotor clearance control system tubes are mounted to brackets on the outside of the turbine case. These tubes supply fan discharge air to cool the surface of the turbine case during cruise operation. The case cooling results in shrinkage of the turbine case and outer airseal duct segments which decreases the blade tip clearances. The resulting reduced tip clearance provides improved turbine efficiency.


TURBINE FRONT HUB (STAGE 1)
STAGE 1 HPT (INNER ROTATING) AIRSEAL
STAGE 1 HPT (OUTER ROTATING) AIRSEAL
STAGE 1 HPT BLADE ASSEMBLY
STAGE 1 HPT DUCT SEGMENT
STAGE 2 HPT RING SEGMENT AND VANE CLUSTER ASSEMBLY
TURBINE CASE ASSEMBLY
TURBINE INTERMEDIATE HUB (STAGE 2)
STAGE 2 HPT (ROTATING) AIRSEAL
STAGE 2 HPT BLADE ASSEMBLY
STAGE 2 HPT DUCT SEGMENT
SECTION A-A
L-A0524
1285

BM5 72 53 00 0 KAMO - 19

High Pressure Turbine
Figure 001


A
A
COMBINED 12TH AND 15TH STAGE AIR
COMBINED 12TH AND 15TH STAGE AIR
DIFFUSER SECONDARY AIR (15TH STAGE AIR)
AUTOMATIC TURBINE ROTOR CLEARANCE CONTROL SYSTEM TUBES
AUTOMATIC TURBINE ROTOR CLEARANCE CONTROL SYSTEM TUBES
FAN DISCHARGE AIR
MODULATED 12TH STAGE AIR
DISCHARGE AIR
L—A0525
BM5 72 53 00 0 KCMO - 19

High Pressure Turbine
Figure 002

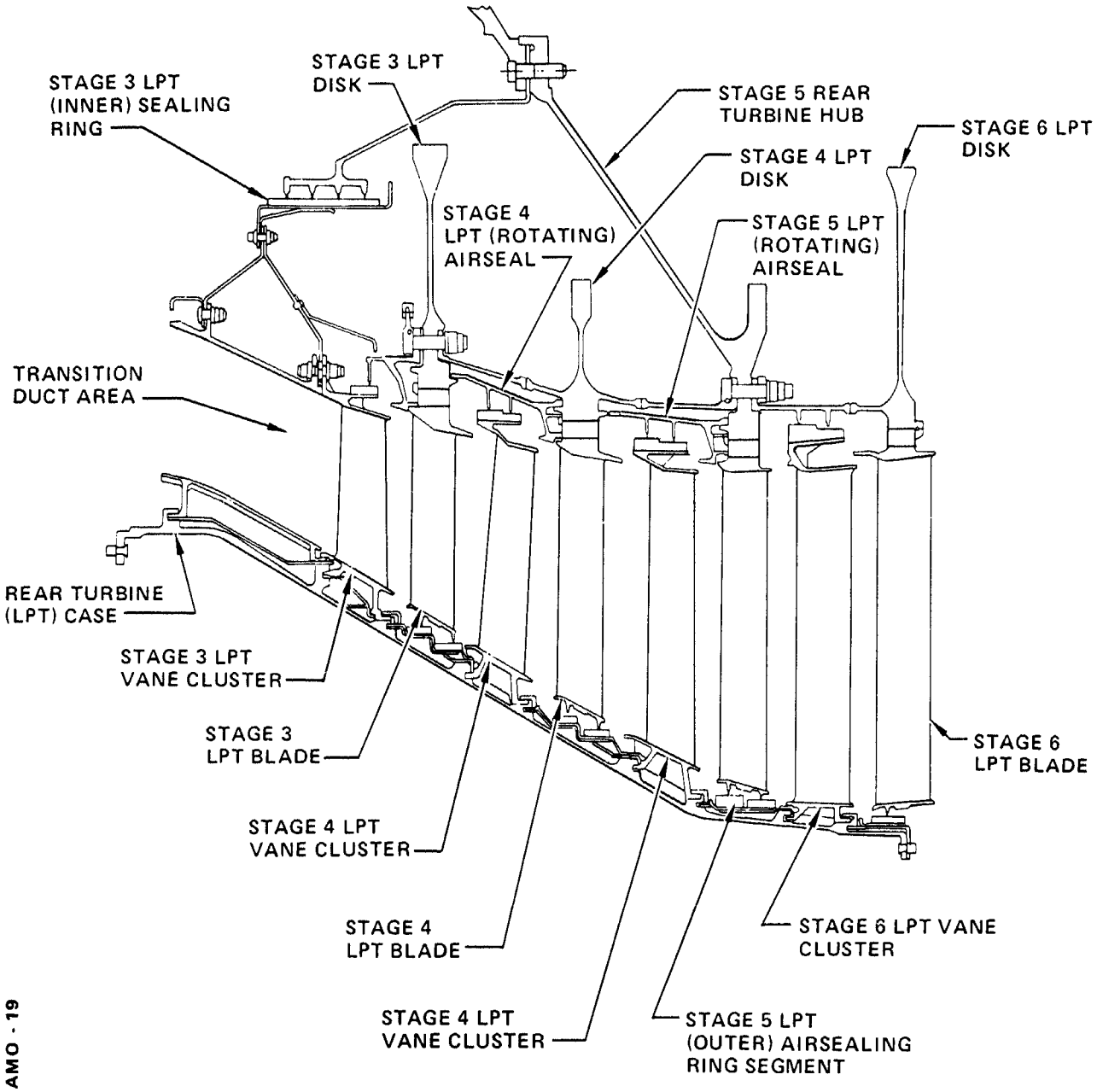
LOW PRESSURE TURBINE STATOR ASSEMBLY - DESCRIPTION AND OPERATION

1. Description (Ref. Fig. 001)

A. The front compressor drive turbine rotor and stator assembly consists of the third, fourth, fifth, and sixth stage rotors and stators, front compressor driveshaft, spacers, airseals, turbine shaft cap, and rear turbine case. The assembly is supported by the No. 1 and No. 4 bearings.

B. Low pressure turbine vanes are constructed of nickel alloy and are assembled as cast clusters of three vanes. The 3rd stage stator incorporates aluminide-coated airfoils, with an aerodynamic transition duct directing gas flow exiting the high pressure turbine. The 3rd stage airseal land is bolted to the inner transition duct shroud and incorporates an abradable honeycomb airseal land in alignment with the four knife-edges of the 3rd stage (inner rotating) thrust balance airseal. Stages 4 through 6 stators incorporate, uncoated airfoils with integral, abradable honeycomb airseal lands on the ID. These seal lands are in alignment with the knife-edges of the 4th and 5th stage (rotating) airseals and the 6th stage disk to form the inner vane seals.

C. The low pressure turbine case is a single piece, machined weldment of six nickel alloy forgings. Internal slotted supports provide hooked engagement with stator vane feet and with outer airseal shroud segments positioned behind each of the four vane stages. The outer airseal shroud segments incorporate abradable honeycomb rubstrips which align with knife-edge seals on turbine blade outer shrouds.


STAGE 3 LPT (INNER) SEALING RING
STAGE 3 LPT DISK
STAGE 5 REAR TURBINE HUB
STAGE 6 LPT DISK
STAGE 4 LPT DISK
STAGE 4 LPT (ROTATING) AIRSEAL
STAGE 5 LPT (ROTATING) AIRSEAL
TRANSITION DUCT AREA
REAR TURBINE (LPT) CASE
STAGE 3 LPT VANE CLUSTER
STAGE 3 LPT BLADE
STAGE 6 LPT BLADE
STAGE 4 LPT VANE CLUSTER
STAGE 4 LPT BLADE
STAGE 6 LPT VANE CLUSTER
STAGE 4 LPT VANE CLUSTER
STAGE 5 LPT (OUTER) AIRSEALING RING SEGMENT
BM5 72 56 00 0 KAMO - 19
L—A0670

Low Pressure Turbine
Figure 001

LOW PRESSURE TURBINE ROTOR ASSEMBLY - DESCRIPTION AND OPERATION

1. General

A. The low pressure turbine provides the rotational driving force for the low pressure compressor. This rotational force is transmitted through a shaft at the center of the engine and coupled to the low pressure compressor. The operating speeds, pressures and temperatures are lower than that of the high pressure turbine as the combustion gasses expand and energy is extracted.

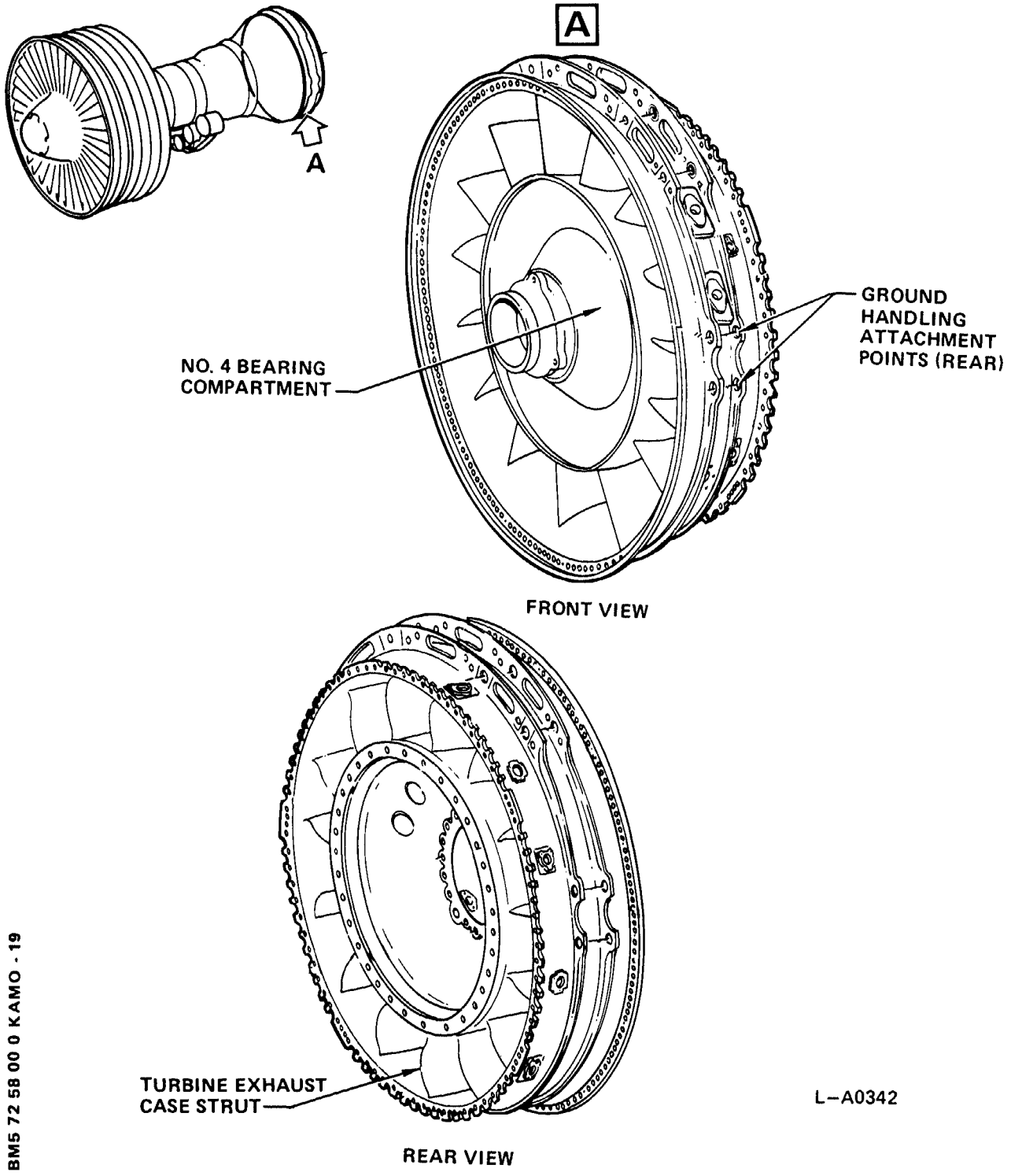
B. The low pressure turbine is a four stage turbine mounted onto the rear of high pressure turbine and is located forward of the turbine exhaust case. The 3rd and 4th stage turbine rotors are each cantilevered and attached to the forward side of the 5th stage rear turbine hub. The 6th stage turbine rotor is also attached to the 5th stage rear hub and is cantilevered to the rearward side. Knife-edge seals are positioned between each of the rotating stages, near the ID to seal the stator vanes from gaspath leakage around the vanes.

C. An automatic turbine rotor clearance control system is incorporated to increase the low pressure turbine efficiency at cruise conditions. This system bleeds fan air onto the external surfaces of the low pressure turbine case through tubes mounted close to the case, thus shrinking the case and decreasing the turbine blade tip clearances.

EXHAUST CASE ASSEMBLY - DESCRIPTION AND OPERATION

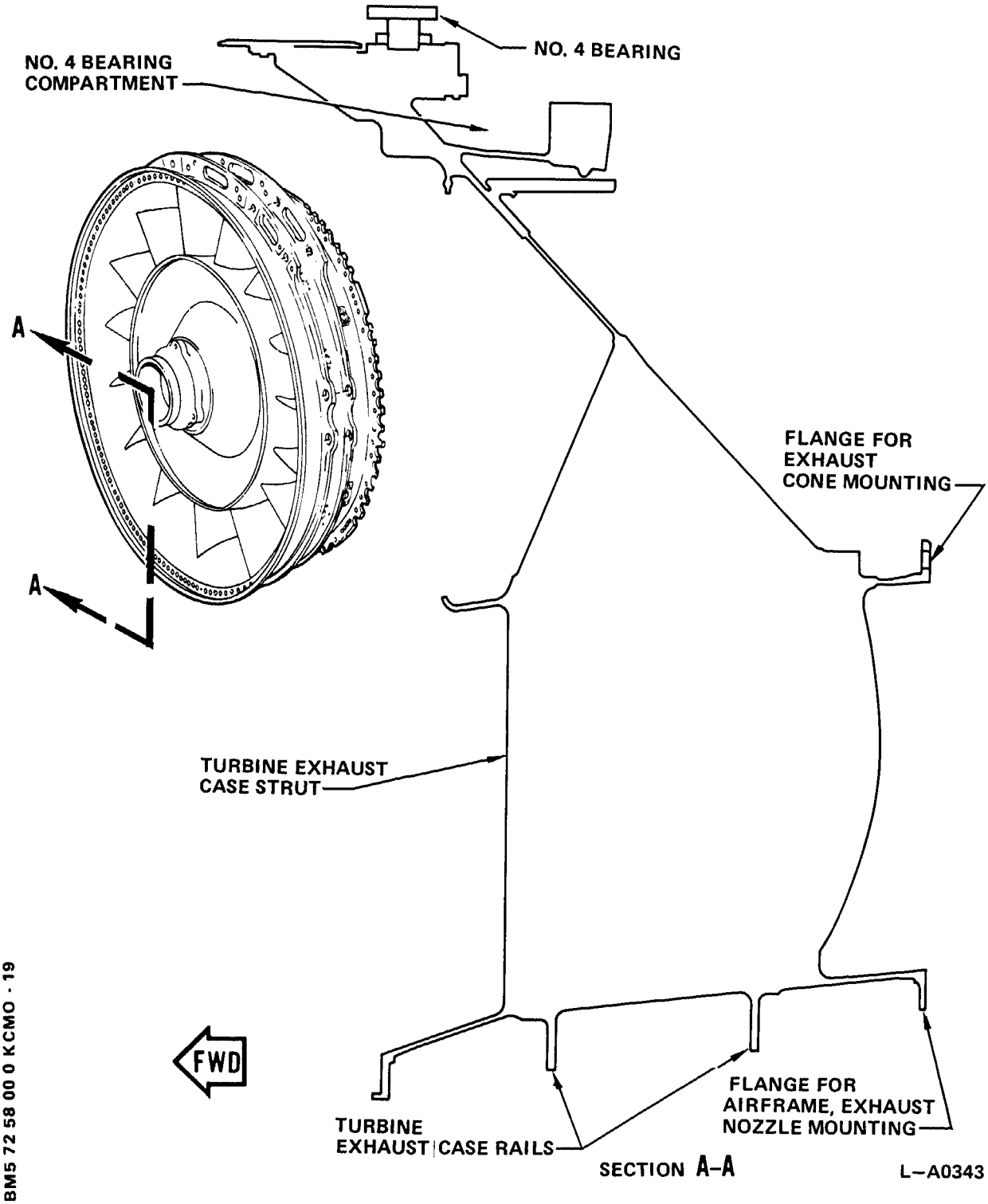
1. General (Ref. Fig. 001, 002)
   The turbine exhaust case assembly is a main structural support member of the engine and provides a housing for the rear (LPT) shaft bearing (No. 4 bearing). This structural case provides the aft attachment point for the power plant to the aircraft pylon (strut). Rear ground handling tool attachment points are also located on this case.
   The turbine exhaust case is the transition duct for the exhaust gas flow from divergent (through the turbines) to convergent (through the exhaust nozzle).

2. Turbine Exhaust Case Description
   The turbine exhaust case is constructed of greek ascoloy stainless steel material and is welded together as a concentric inner cone segment and outer duct ring joined by 15 airfoil shaped radial struts. Two circumferential rails on the OD of the case provide structural stiffness to the outer duct. These rails also provide mounting points for the rear of the engine on the aircraft strut and for ground handling.
   Provisions are made in the rear mount rails for the attachment of the engine (lower) aft mount links to carry engine vertical, side and torsional loads to the airframe structure.
   The engine rear ground handling provisions consist of two holes through the rear mount rail on the horizontal centerline.
   Probes are installed between the exhaust case struts at four locations. At two locations probes measure gaspath total temperature (T4.95). At the other two locations, probes measure gaspath total temperature and total gaspath pressure (Ref. 77-00-00, P. Block 1).



BM5 72 58 00 0 KAMO - 19

Turbine Exhaust Case Assembly
Figure 001



Turbine Exhaust Case
Figure 002

1. No. 4 Bearing Compartment and Tube Inspection Cleaning

A. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Gasket
C.	Key Washer
D.	Packing
E.	Wire, Thrust
F.	Lockwire (MS9226-03)
G.	Jackscrews (0.190-32 ; 8 to 10 necessary)
H.	Bergen Mechanical Crimper (Optional) Model M303, M305 or M307
I. PWA85307	Puller, Jackscrew (for No. 4 Bearing Cover, Pre SB PW4ENG 72-385)
J. Material No.P03-001	Oils (Ref. 70-00-00)
K. Material No.P05-007	Special Materials (Ref. 70-00-00)
L. Material No.P05-233	Special Materials (Ref. 70-00-00)
M. Material No.P05-289	Special Materials (Ref. 70-00-00)
N. Material No.P05-291	Special Materials (Ref. 70-00-00)
P Material No.P05-292	Special Materials (Ref. 70-00-00)
R Q. Material No.P06-054	Lubricants (Ref. 70-00-00)
R. Material No.P06-021	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Standard Practices
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 72-00-00, P. Block 601	Engine - General
- 79-22-03, P. Block 601	Magnetic Chip Collectors

B. Job Set-Up

(1)Open, safety and tag the circuit breakers for the appropriate engine. Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Procedure

(1)Remove the No. 4 bearing cover (Ref. Fig. 201).

(a)Remove the bolts (6) that attach the No. 4 bearing shield to the turbine exhaust case rear inner flange (1). Remove the shield (5). Remove the No. 4 bearing heat shield (4).

(b)For No. 4 bearing cover (3) that has six small tapped holes (pre SB PW4ENG 72-385), install a PWA 85307 Jackscrew Puller to the inner bolt hole flange of the exhaust case. Attach the detail channel to the case with the two detail bolts, washers and nuts. Put the small plate of the puller over the tapped holes and attach with the six detail knurled screws. Turn the jackscrew T handle to disengage the cover from the exhaust case. Remove the jackscrew puller and the cover

from the exhaust case. Remove the jackscrew puller from the cover.

(c)For No. 4 bearing cover (3) that has eight jackscrew holes (Post SB PW4ENG 72-385), install and evenly tighten eight 0.190-32 jackscrews to remove the cover.

(d)Discard the packing (2).

(2)Visually examine the No. 4 bearing compartment and cover for coke. (Ref. Fig. 207)

NOTE : Coke is any accumulation of carbon buildup that is black in color, brittle and irregular in surface texture. It is possible that areas of coke have formed flakes and are missing from the compartment walls. Loose coke is coke which is easily removed with a vacuum or tweezers.

(a)You must make a visual inspection of eight oil supply holes as shown (Ref. Fig. 207) and do as follows :

1 Carefully remove any loose coke from the oil supply holes.

2 If coke cannot be removed from the holes, the engine must be removed from service immediately or a ferry flight is permitted to return the aircraft to a base that can change the engine. If you ferry flight the engine, you must clean the No. 4 bearing tubes and nozzle as specified in the following steps.

(b)You must make an inspection of the 11 oil drain holes as shown (Ref. Fig. 207) and do as follows :

1 Carefully remove any loose coke from the oil drain holes.

2 If more than two holes are plugged, the engine must be removed from service immediately.

NOTE : Plugged holes have coke that totally blocks or partially blocks the holes.

3 If one or two holes are plugged (this includes partially plugged holes) the engine must be removed from service immediately or a ferry flight is permitted to return the aircraft to a base than can change the engine. If you ferry flight the engine, you must clean the No. 4 bearing tubes and nozzle as specified in the following steps.

(c)If the No. 4 bearing compartment has coke on the bearing, cage or rollers or on more than 50 percent of the compartment surfaces, proceed as follows :

1 Check for oil system contamination (Ref. 72-00-00, P. Block 601).

2 The engine must be removed from service within 100 hours, however, prior to the continue-in-service period you must remove and/or inspect the tubes and oil nozzle as specified in the following steps.

3 During the 100 hour Continue-in-Service period inspect the oil tank magnetic probe at 25 hour intervals (Ref. 79-22-03, P. Block 601).

(d)If the No.4 bearing compartment does not have coke :

1 (Pre SB PW4ENG 72-472) Remove the No. 4 bearing (oil) nozzle and No. 4 bearing transfer tube.

2 (Post SB PW4ENG 72-472) Remove the No. 4 bearing (oil) nozzle, No. 4 bearing damper supply tube, front No. 4 bearing nozzle assembly, and packing transfer tube.

3 Remove the No.4 bearing oil scavenge (inner) tube.

4 Remove the No.4 bearing (oil) pressure tube.

5 Remove the No.4 bearing scavenge tube.

(3)(Pre SB PW4ENG 72-472) remove the No. 4 bearing (oil) nozzle and No. 4

bearing transfer tube (Ref. Fig. 202)
(a)Remove bolts (8) and key washers (6) and (7) that attach the No. 4 bearing transfer tube (5) to the No. 4 bearing nozzle (4). Remove the tube.
(b)Remove bolts (1) and key washers (2) and (3) that attach No. 4 bearing nozzle (4) to the exhaust case. Remove the nozzle.
(4)(Post SB PW4ENG 72-472) Remove the No. 4 beearing (oil) nozzle and front No. 4 bearing nozzle. (Ref. Fig. 203)
(a)Remove the bolts and key washer (1) that attach the front No. 4 bearing nozzle to the No. 4 bearing support flange at the 12 o'clock position. Discard the key washer. (Ref. Fig. 203) (Sheet 1)
(b)Move the packing transfer tube (5) into the elbow of the No. 4 bearing damper supply tube (2). Remove the nozzle. (Ref. Fig. 203) (Sheet 2)
(c)Remove the packing transfer tube from the damper supply tube. Discard the two packings (4).
(d)Remove the bolts and key washers (6) and (7) that attach the No. 4 bearing damper supply tube (2) to the No. 4 bearing oil nozzle (1). Remove the tube.
(e)Remove the bolts and key washers (6) and (7) that attach the No. 4 bearing nozzle (1) to the exhaust case. Remove the nozzle.
R (5)(Pre SB PW4ENG 79-76) Remove the No. 4 bearing oil scavenge (inner)
R tube. (Ref. Fig. 204)
(a)Remove key washer (2) and bolt (3) that attach the tube bracket to the No. 4 bearing housing ID at the 6 o'clock position.
(b)Remove key washers (2) and bolts (3) that attach the No. 4 bearing oil scavenge (inner) tube (4) to the housing ID at the 7:30 o'clock location. Remove the scavenge tube. Discard the gasket (1).

R (6)(Pre SB PW4ENG 79-76) Remove the No. 4 bearing (oil) pressure tube. (Ref. Fig. 205)
CAUTION : HOLD THE STRAINER HOUSING AT THE WRENCHING FLATS WHEN YOU LOOSEN THE TUBE NUT. FAILURE TO DO THIS CAN CAUSE TOO MUCH STRESS ON THE TUBE ASSEMBLY.
(a)Remove the lockwire and disconnect the No. 4 bearing (oil) pressure tube (4) from the No. 4 bearing strainer housing (1) at the 11 o'clock position between Flanges R and S.
(b)Remove and discard the thrust wire (3) and remove the nut (2) from the pressure tube.
(c)Remove the lockwire (10) that attaches the No. 4 bearing pressure tube heat shield to the tube. Remove the heat shield (front) (7) and (rear) (9) from the tube.
(d)Remove lockwire and bolts (6) that attach the No. 4 bearing tube guide (5) to the case.
(e)Use a wrench to hold the adapter (8) and disconnect the nut that attaches the tube to the adapter.
(f)Move the tube radially inward and remove it from the case.
(g)Install protective closures.
R (7)(Post SB PW4ENG 79-76) Remove the No. 4 bearing (oil) pressure tube.
R (Ref. Fig. 208, 209)
R (a)Remove the No. 4 pressure tube (10) from the turbine exhaust case at
R the 4:30 o'clock position.

R 1 Remove two bolts (1) that attach the tube shield (16) and bracket
R (2) to the turbine exhaust case.
R 2 Remove the tube shield (16), bracket (2), thrust wire (18) and nut
R (17) from the outboard end of the pressure tube.
R 3 Remove the bolt (6) and nut (12) that attach the tube to the
R bracket (8).
R 4 Remove the tube nut from the adapter (14) and move the tube
R radially inward and remove the pressure tube from the case.
R (b)Cut the restraining straps (3) and remove the insulation slide clamp
R (13) and shield sets (9) and (4) from the tube.
R (c)Remove the optional fiberglass wear wrap from the tube as necessary.
R (d)Remove bolts (5) and bracket (8) from the turbine exhaust case.
R (e)Remove adapter (14) and packing (15). Discard the packing.

R (8)(Pre SB PW4ENG 79-76) Remove the No. 4 bearing oil scavenge tube (outer).
(Ref. Fig. 206)

CAUTION : HOLD THE SCAVENGE TUBE (REAR) AT THE WRENCHING FLATS WHEN YOU LOOSEN THE TUBE NUT. FAILURE TO DO THIS CAN CAUSE TOO MUCH STRESS ON THE TUBE ASSEMBLY.

(a)Remove the lockwire and disconnect the No. 4 scavenge tube (outer) (4) from the No. 4 bearing oil scavenge tube (rear) (1) at the 10 o'clock position between Flanges R and S.
(b)Remove and discard the thrust wire (3) and remove the nut (2) from the scavenge tube.
(c)Remove the lockwire (10) that attaches the No. 4 bearing scavenge tube heat shield to the tube. Remove the heat shield (front) (7) and (rear) (9) from the tube.
(d)Remove lockwire and bolts (6) that attach the No. 4 bearing tube guide (5) to the case.
(e)Use a wrench to hold the adapter (8) and disconnect the nut that attaches the tube to the adapter.
(f)Move the tube radially inward and remove it from the case.
(g)Install protective closures.

R (9)(Post SB PW4ENG 79-76) Remove the No. 4 bearing scavenge tube (outer).
R (Ref. Fig. 210)
R (a)Remove the No. 4 scavenge tube (10) from the turbine exhaust case at
R at the 4:00 o'clock position.
R 1 Remove two bolts (1) that attach the tube shield (16) to the turbine
R exhaust case.
R 2 Remove the tube shield (16), thrust wire (18) and nut (17) from the
R outboard end of the scavenge tube.
R 3 Remove the bolt (6) and nut (12) that attach the tube to the
R bracket (8).
R 4 Remove the tube nut from the adapter (14) and move the tube
R radially inward and remove the scavenge tube from the case.
R (b)Cut the restraining straps (3) and remove the insulation slide clamp
R (13) and shield sets (9) and (4) from the tube.
R (c)Remove the optional fiberglass wear wrap from the tube if necessary.
R (d)Remove bolts (5) and bracket (8) from the turbine exhaust case.
R (e)Remove adapter (14) and packing (15). Discard the packing.

R (10)Clean the bearing compartment pressure oil passage way.
(a)Apply 10 psig (68.9 kPa) minimum air pressure to the pressure supply core passage way in the bearing compartment through adapter (8). Ensure that the passage is fully open. Air leakage is permitted, as this is not a test.
NOTE : The air will clear the passage way of any coke flakes that could have fallen through the pressure tube during removal.

R (11)If necessary, clean the tubes internally.
CAUTION : DO NOT USE COMPRESSED AIR OR A ROTATING CABLE TO CLEAN THE TUBES OR DAMAGE TO THE TUBE CAN RESULT.
CLEANING OF THE TUBES IS NOT PERMITTED WHILE THE TUBES ARE INSTALLED.
(a)Clean the tubes internally with a suitable Tube Brush Material No.P05-233.
NOTE : You can clean the tubes in vapor or solvent degreaser if such facilities are available.

R (12)Inspect the tubes for cracks, especially near the middle support spacer. Cracked or badly distorted tubes must be repaired or replaced.

R (13)Clean the No. 4 bearing compartment of all loose coke deposits with a
R Tube Brush (Material No.P05-233). Make sure you remove all loose deposits
R which could block the scavenge tube.

R (14)(Pre SB PW4ENG 72-472) Install a clean No. 4 bearing oil nozzle and No. 4 bearing transfer tube. (Ref. Fig. 202)
NOTE : It is not necessary to perform an oil flow or airflow tests on the clean oil nozzle prior to or after installation.
(a)Install a clean No. 4 bearing nozzle into the port in the pad on the exhaust case rear inner diameter. Attach the nozzle with two bolts (1), lubricated with Material No.P03-001, and two kay washers (2) and (3). Hand tighten the bolts.
(b)Install the No. 4 bearing transfer tube (5) through the port in nozzle (4) and into the port in the exhaust case rear flange. Attach the transfer tube with two bolts (8), lubricated with Material No.P03-001, and washers (6) and (7). TORQUE the bolts (1) to attach the nozzle to the exhaust case and bolts (8) to attach the transfer tube to nozzle to between 75 and 85 lbf.in. (0.85 and 0.96 m.daN). Bend the tabs of washers (2), (3), (6) and (7).

R (15)(Post SB PW4ENG 72-472) Install a clean No. 4 bearing (oil) nozzle and No. 4 bearing damper supply tube. (Ref. Fig. 203)
(a)Install the No. 4 bearing nozzle (1) in the port in the pad on the exhaust case rear inner diameter at the 1:30 o'clock position. (Ref. Fig. 203) (Sheet 2). Install the nozzle with two bolts (6) and (7), with threads lubricated with Engine Oil (Material No.P03-001) and two washers (6) and (7).
(b)Install the No. 4 bearing damper supply tube (2) through the 0.380 inch (9.652 mm) diameter hole in the nozzle (1) and into the port in the exhaust case rear flange. Install the damper tube with two bolts (6) and (7), with threads lubricated with Engine Oil (Material No.P03-001) and washers (6) and (7). TORQUE the bolts that attach the nozzle to the exhaust case and bolts that attach the damper supply tube to the nozzle to between 75 and 85 lbf.in (0.85 and 0.96 m.daN). Bend the tabs of washers.

R (16)(Post SB PW4ENG 72-472) Install a clean No. 4 bearing front nozzle assembly and the packing transfer tube (damper tube to front nozzle). (Ref. Fig. 203)

(a)Lubricate two packings (4) with Engine Oil (Material No.P03-001). Install the packings in the grooves of the packing transfer tube (5). Insert one end of the tube into the port in the front No. 4 bearing nozzle (3).(Ref. Fig. 203) (Sheet 2)

(b)Align the boltholes in the flange of the front nozzle with the two retainer plate boltholes at the 12 o'clock position ; and insert the nozzle through the hole in the No. 4 bearing support flange at the 12:30 o'clock position. (Ref. Fig. 203) (Sheet 1)
Insert the end of the transfer tube in the port in the elbow of the No. 4 bearing damper supply tube. Put the retaining plate (1), chamfered side out, on the retainer plate pad (under the nozzle flange). Put the key washer (2) over the oil nozzle flange, and install two bolts, with threads lubricated with Engine Oil (Material No.P03-001).

(c)Make sure that the clearance gap (3) between the retainer plate and the grooves in the bearing outer race is 0.010 and 0.050 in. (0.25 and 1.27 mm) (Ref. Fig. 203) (Sheet 1).
TORQUE the bolts that attach the retainer plate to between 75 and 85 lbf.in (0.85 and 0.96 m.daN). Bend the tabs of the key washer, (Ref. Fig. 203) (Sheet 1).

R (17)(Pre SB PW4ENG 79-76) Install a clean No. 4 bearing scavenge (inner)
R tube. (Ref. Fig. 204)

(a)Install a new gasket (1) in the groove in the recessed pad in the No. 4 bearing housing rear inner diameter.

(b)Align boltholes in the flange of the No. 4 bearing oil scavenge tube (4) with boltholes in the recessed pad, and align the bolthole in tube bracket with the bolthole in the No. 4 bearing housing ID. Connect the tube with three bolts (3) and key washers (2). TORQUE the bolts to between 32 and 36 lbf.in (0.37 and 0.41 m.daN). Bend tabs of key washers.

R (18)(Pre SB PW4ENG 79-76) Install the No. 4 bearing oil scavenge tube
R (outer). (Ref. Fig. 206)

(a)Remove protective closures.

(b)Install the No. 4 bearing tube guide (5) onto the scavenge tube (4). Install the scavenge tube, straight end first, into the opening in the exhaust case inner wall and through the strut at approximately 10:30 o'clock location. Connect the tube nut detail, lubricated with Engine Oil (Material No.P03-001), to the adapter (8) on the rear inner flange of the exhaust case at the 7:30 o'clock location. Hand tighten the nut.

(c)Install two bolts (6), lubricated with Engine Oil (Material No.P03-001) to attach the tube guide to the inner wall of the case. Hand tighten the bolts.

(d)Apply 10 psig (68.9 kPa) minimum air pressure to the outboard end of the tube. Ensure that there is positive flow through the scavenge tube in the sump. Air leakage is permitted, as this is not a test. If the airflow is clogged, remove and reinstall the following parts to determine the cause :

- No. 4 bearing oil scavenge tube (outer)
- No. 4 bearing oil scavenge tube (inner).

(e)TORQUE the two bolts (6) that hold the tube guide to between 75 and 85 lbf.in (0.85 and 0.96 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).

(f)Use a wrench to hold the adapter (8) and TORQUE the tube nut to between 320 and 350 lbf.in (3.62 and 3.95 m.daN). Install Lockwire (Material No.P05-289).

(g)Position nut (2) onto the outboard end of scavenge tube (4). Connect the nut to tube with new thrust wire (3) (Ref. 70-00-00, P. Block 201).

R (19)(Post SB PW4ENG 79-76) Install No. 4 bearing oil scavenge (inner) tube
R and (outer) tube. (Ref. Fig. 210, 211)

R (a)Install adapter (1) lubricated with Engine Oil (Material No.P03-001) and new packing (2) into threaded hole in rear inner flange of exhaust case at 7:30 o'clock position. TORQUE the adapter to between 150 and 170 lbf.in (1.70 and 1.92 m.daN).

R (b)Install new gasket (3) to groove in recess in the exhaust case rear inner diameter.

R (c)Align boltholes in flange of No. 4 bearing oil scavenge tube (8) with boltholes in the recessed pad in exhaust case rear inner diameter. Align bolthole in detail tube bracket with bolthole in exhaust case inner diameter. Attach the tube with three bolts (6) lubricated with Engine Oil (Material No.P03-001) and key washers (7). TORQUE the bolts to between 32 and 36 lbf.in (0.37 and 0.40 m.daN). Bend the tabs of the key washers.

R (d)No. 4 bearing scavenge tube option to prevent possible wear to the No. 4 bearing scavenge tube (10), a fiberglass tape wear Wrap (Material No. P05-136) is provided as an option.

R (e)Install the shield set (9) and the heat shield insulation slide clamp (13) on the elliptical section of the No. 4 scavenge tube (10).

R NOTE : The shield is installed on the section of the tube that goes through the strut of the turbine exhaust case.

R (f)Install the shield set (4) on the No. 4 scavenge tube as follows :

R 1 Place the two halves over the round section of the tube.

R 2 Install one restraining strap (3) through the loops on the section of the shield that overlaps the shield set (9).

R 3 Put the loop clamp (7) on the wear sleeve of the shield set and attach temporarily with a work bolt and nut.

R 4 Pull the strap to make the shield set tight on the tube. Cut off excess strap material.

R (g)Attach bracket (8) to the turbine exhaust case with two bolts (5). TORQUE the bolts to between 75 and 85 lbf.in (0.85 and 0.96 m.daN).

R (h)Install the No. 4 scavenge tube through the strut at the 8:00 o'clock position.

R 1 Attach the tube nut to the adapter (14) handtight.

R NOTE : The shield may be separated to attach the tube nut to the adapter.

R 2 Remove the work bolt and replace with bolt (6) and nut (12). Attach to the bracket (8).

R 3 TORQUE the nut on the inboard end of the scavenge tube to the

R adapter (1) to between 225 and 250 lbf.in (2.55 and 2.82 m.daN).
R Safety the tube nut with Lockwire (Material No. P05-289).
R 4 TORQUE the bolt (6) that attaches the clamp (7) to the bracket
R (8) to between 32 and 36 lbf.in (0.37 and 0.40 m.daN).
R 5 Install four more straps (3) to hold the shield in position.
R 6 Pull the strap to make the shield set tight on the tube. Cut off
R excess strap material.
R 7 Position the nut (17) to the outboard end of the scavenge tube
R and safety the nut with thrust wire.
R 8 Attach the tube shield (16) to the turbine exhaust case at the
R 8:00 o'clock position. Push it on over the nut (17).
R 9 Install two bolts (1) to retain the shield and TORQUE to between
R 32 and 36 lbf.in (0.37 and 0.40 m.daN). Safety the bolts with
R Lockwire (Material No. P05-289) or Safety Cable (Material No.
R P05-291) and Safety Cable Ferrule (Material No. P05-292).

R (20)(Pre SB PW4ENG 79-76) Install a clean No. 4 bearing (oil) pressure tube. (Ref. Fig. 205)

(a) Remove protective closures.

(b) Install the No. 4 bearing tube guide (5) onto the No. 4 bearing pressure tube (4). Install the pressure tube, straight end first, into the opening in the exhaust case inner wall and through the strut at approximately the 11 o'clock location. Connect the tube nut detail, lubricated with Engine Oil (Material No.P03-001) to the adapter (8) on the rear inner flange of the exhaust case at the 1:30 o'clock position. Hand tighten the nut.

(c) Install two bolts (6), lubricated with Engine Oil (Material No.P03-001) to attach the tube guide to the inner wall of the case. Hand tighten the bolts.

(d) Apply 10 psig (68.9 kPa) minimum air pressure to the outboard end of the tube. Ensure that there is positive flow through the oil nozzle. Air leakage is permitted, as this is not a test. If the airflow is clogged, remove and reinstall the following parts to determine the cause :
- No. 4 bearing oil pressure tube
- No. 4 bearing oil nozzle and transfer tube

(e) TORQUE the two bolts (6) that hold the tube guide to between 75 and 85 lbf.in (0.85 and 0.96 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292).

(f) Use a wrench to hold the adapter (8) and TORQUE the tube nut to between 320 and 350 lbf.in (3.62 and 3.95 m.daN). Install Lockwire (Material No.P05-289).

(g) Install the nut (2), to the outboard end of the pressure tube (4). Attach the nut to the tube with new thrust wire (3) (Ref. 70-00-00, P. Block 201).

R CAUTION : YOU MUST APPLY ENGINE OIL FULLY TO THE COVER PACKING OR YOU
R WILL CUT THE PACKING DURING INSTALLATION. A CUT PACKING WILL
R CAUSE SUBSEQUENT OIL LOSS AND CAN CAUSE AN IN-FLIGHT
R SHUTDOWN.
R CAUTION : INSTALL THE COVER INTO POSITION USING EIGHT TO TEN WORK BOLTS
R EQUALLY SPACED AROUND THE COVER. TIGHTEN THE BOLTS EQUALLY IN

R SMALL INCREMENTS TO PULL THE COVER INTO POSITION EQUALLY.
R MONITOR THE ENGAGEMENT OF THE COVER TO MAKE SURE THAT THE
R PACKING IS NOT CUT DURING INSTALLATION. A CUT PACKING WILL
R CAUSE SUBSEQUENT OIL LOSS AND CAN CAUSE AN IN-FLIGHT
R SHUTDOWN.
R (21)(Post SB PW4ENG 79-76) Install No. 4 bearing (oil) pressure tube.
R (Ref. Fig. 212, 213)
R (a)Install adapter (5) lubricated with Engine Oil (Material No.P03-001)
R and new packing (6) into threaded hole in the rear inner flange of the
R exhaust case at 1:30 o'clock position. TORQUE the adapter to between
R 150 and 170 lbf.in (1.70 and 1.92 m.daN).
R (b)No. 4 bearing pressure tube option to prevent possible wear to the
R No. 4 bearing pressure tube (14), a fiberglass tape wear Wrap (Material
R No. P05-136) (17) is provided as an option.
R (c)Install the shield set (15) and the heat shield insulation slide
R clamp (16) on the elliptical section of the No. 4 bearing pressure
R tube (14).
R NOTE : The shield is installed on the section of the tube that
R goes through the strut of the turbine exhaust case.
R (d)Install the shield set (7) on the No. 4 bearing pressure tube as
R follows :
R 1 Place the two halves over the round section of the tube.
R 2 Install one restraining strap (18) through the loops on the
R section of the shield that overlaps the shield set (15).
R 3 Pull the strap to make the shield set tight on the tube. Cut off
R excess strap material.
R 4 Put the loop clamp (10) on the wear sleeve of the shield set and
R attach temporarily with a work bolt and nut.
R (e)Attach bracket (11) to the turbine exhaust case with two bolts (8).
R TORQUE the bolts to between 75 and 85 lbf.in (0.85 and 0.96 m.daN).
R (f)Install the No. 4 pressure tube through the strut at the 4:30 o'clock
R position.
R 1 Attach the tube nut to the adapter (5) handtight.
R NOTE : The shield may be separated to attach the tube nut to the
R adapter.
R 2 Remove the work bolt and replace with bolt (9) and nut (12).
R Attach to the bracket (11).
R 3 TORQUE the tube nut to the adapter (5) to between 225 and
R 250 lbf.in (2.55 and 2.82 m.daN). Safety the tube nut with
R Lockwire (Material No. P05-289).
R 4 TORQUE the bolt (9) that attaches the clamp (10) to the bracket
R (11) to between 32 and 36 lbf.in (0.37 and 0.40 m.daN).
R 5 Install four more straps (18) to hold the shield in position.
R 6 Pull the strap to make the shield set tight on the tube. Cut off
R excess strap material.
R 7 Install bracket (2) over the outboard end of the tube.
R 8 Position the nut (4) on the outboard end of the tube and secure
R the nut to the tube with thrust wire (19).
R 9 Attach the tube shield (3) to the turbine exhaust case at the
R 4:30 o'clock position. Push it on over the nut (4).
R Align the shield with the bracket (2).

10 Install two bolts (1) to retain the shield and TORQUE to between 32 and 36 lbf.in (0.37 and 0.40 m.daN). Safety the bolts with Lockwire (Material No. P05-289) or Safety Cable (Material No. P05-291) and Safety Cable Ferrule (Material No. P05-292).

(22)Install the No. 4 bearing cover as follows : (Ref. Fig. 201)

CAUTION : YOU MUST APPLY ENGINE OIL FULLY TO THE COVER PACKING OR YOU WILL CUT THE PACKING DURING INSTALLATION. A CUT PACKING WILL CAUSE SUBSEQUENT OIL LOSS AND CAN CAUSE AN IN-FLIGHT SHUTDOWN.

CAUTION : INSTALL THE COVER INTO POSITION USING EIGHT TO TEN WORK BOLTS EQUALLY SPACED AROUND THE COVER. TIGHTEN THE BOLTS EQUALLY IN SMALL INCREMENTS TO PULL THE COVER INTO POSITION EQUALLY. MONITOR THE ENGAGEMENT OF THE COVER TO MAKE SURE THAT THE PACKING IS NOT CUT DURING INSTALLATION. A CUT PACKING WILL CAUSE SUBSEQUENT OIL LOSS AND CAN CAUSE AN IN-FLIGHT SHUTDOWN.

(a)Apply Engine Oil (Material No.P03-001) fully to the new packing (2).
(b)Install the new packing into the groove at the rear flange of the No. 4 bearing cover.
(c)Install the cover (3) into the rear inner flange of the exhaust case.
(d)Install 8 to 10 work bolts equally spaced around the cover.
(e)Tighten the bolts equally in small increments to pull the cover into position equally.
(f)Monitor the engagement of the cover to make sure the packing is not cut.
(g)TORQUE the work bolts to between 85 and 95 lbf.in (0.97 and 1.07 m.daN) after the cover is fully seated.

(23)Leak check the No. 4 bearing cover, the No. 4 bearing oil pressure tube, the No. 4 bearing oil scavenge tube and the bearing cover mating flanges.
(a)Install a cap to the outboard end of the oil pressure tube (4).
(b)Apply between 18.0 and 20.0 psig (124.1 and 137.9 kPa) air pressure to the outboard end of the scavenge tube (4).
(c)Apply Leak Check Fluid (Material No.P05-007) at the tube connections on the inboard end of the pressure tube (4), the inboard end of the oil scavenge tube (4), the empty bolt holes in the bearing cover and all around the bearing cover (3) to exhaust case mating flanges.
(d)No leaks are permitted. If leaks are found, disassemble and correct the cause of the leaks. If no leaks are found, continue the assembly.
(e)Remove the 8 to 10 work bolts.

(24)Install the No. 4 bearing heat shield as follows : (Ref. Fig. 201)
(a)Position the No. 4 bearing heat shield (4) into the recess in the No. 4 bearing shield (5). Align the holes and install the shield over the No. 4 bearing cover. Attach the shield with 30 bolts (6), lubricated with Engine Oil (Material No.P03-001). TORQUE the bolts to between 85 and 95 lbf.in (0.97 and 1.07 m.daN).

(25)Complete the installation of the No. 4 bearing oil scavenge tube (outer) and the No. 4 bearing oil pressure tube as follows : (Ref. Fig. 205, 206)

CAUTION : HOLD THE SCAVENGE TUBE (REAR) AT THE WRENCHING FLATS WHEN YOU TIGHTEN THE TUBE NUT. FAILURE TO DO THIS CAN CAUSE TOO MUCH STRESS ON THE TUBE ASSEMBLY.

R (a)Connect the nut (2), threads lubricated with Antiseize Compound
R (Material No.P06-054), to the No. 4 bearing scavenge tube (rear).

TORQUE the nut to between 200 and 225 lbf.in (2.26 and 2.54 m.daN). Install Lockwire (Material No.P05-289).

(b) Position the No. 4 bearing scavenge tube heat shields (7) and (9) around the inboard end of the tube. Install Lockwire (10) PN MS9226-03 through eyelets in the heat shield (Ref. 70-00-00, P. Block 201).

CAUTION : HOLD THE PRESSURE TUBE (UPPER) AT THE WRENCHING FLATS WHEN YOU TIGHTEN THE TUBE NUT. FAILURE TO DO THIS CAN CAUSE TOO MUCH STRESS ON THE TUBE ASSEMBLY.

(c) Connect the nut (2), lubricated with Antigalling Compound (Material No.P06-021), to the No. 4 bearing oil pressure tube (1). TORQUE the nut to between 200 and 225 lbf.in (2.26 and 2.54 m.daN). Install Lockwire (Material No.P05-289).

(d) Position the No. 4 bearing heat shields (front) (7) and (rear) (9) around the inboard end of the tube. Install Lockwire (10) PN MS9226-03 through the eyelets to hold the heat shields (Ref. 70-00-00, P. Block 201).

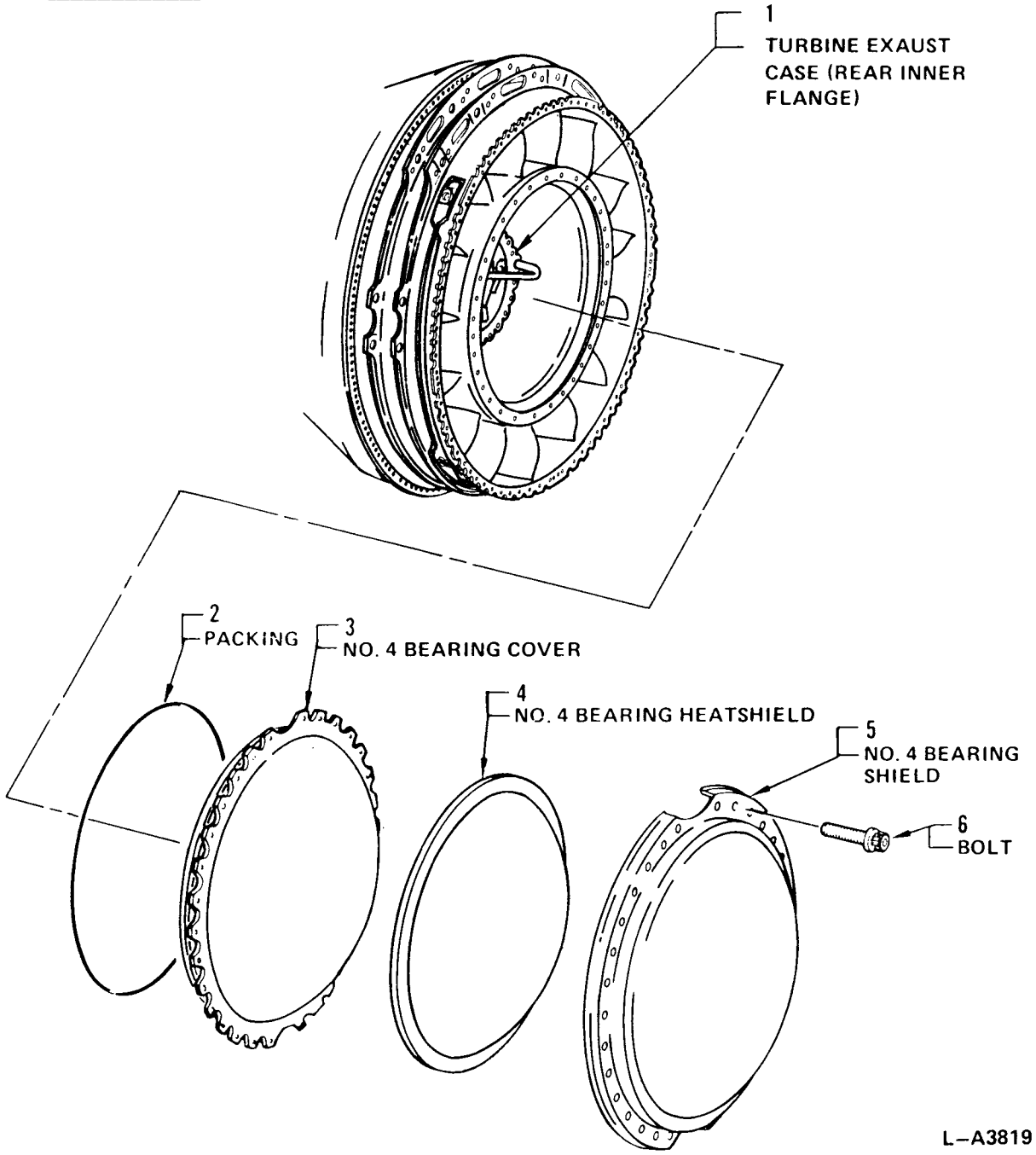
D. Close-Up

(1) Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2) Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers for the appropriate engine.

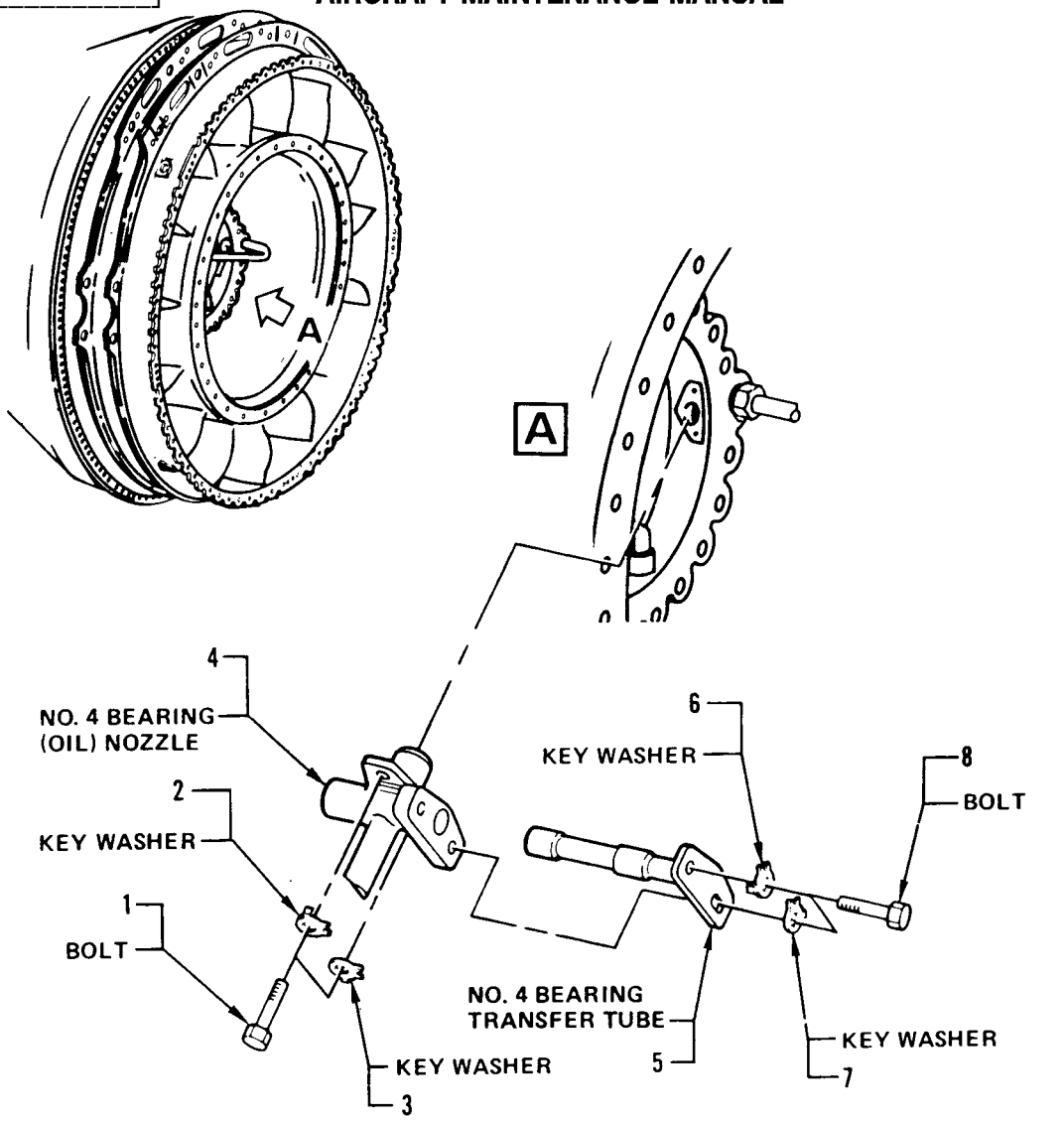
E. Test

(1) Test engine per test reference table (Ref. 71-00-00, P. Block 501).



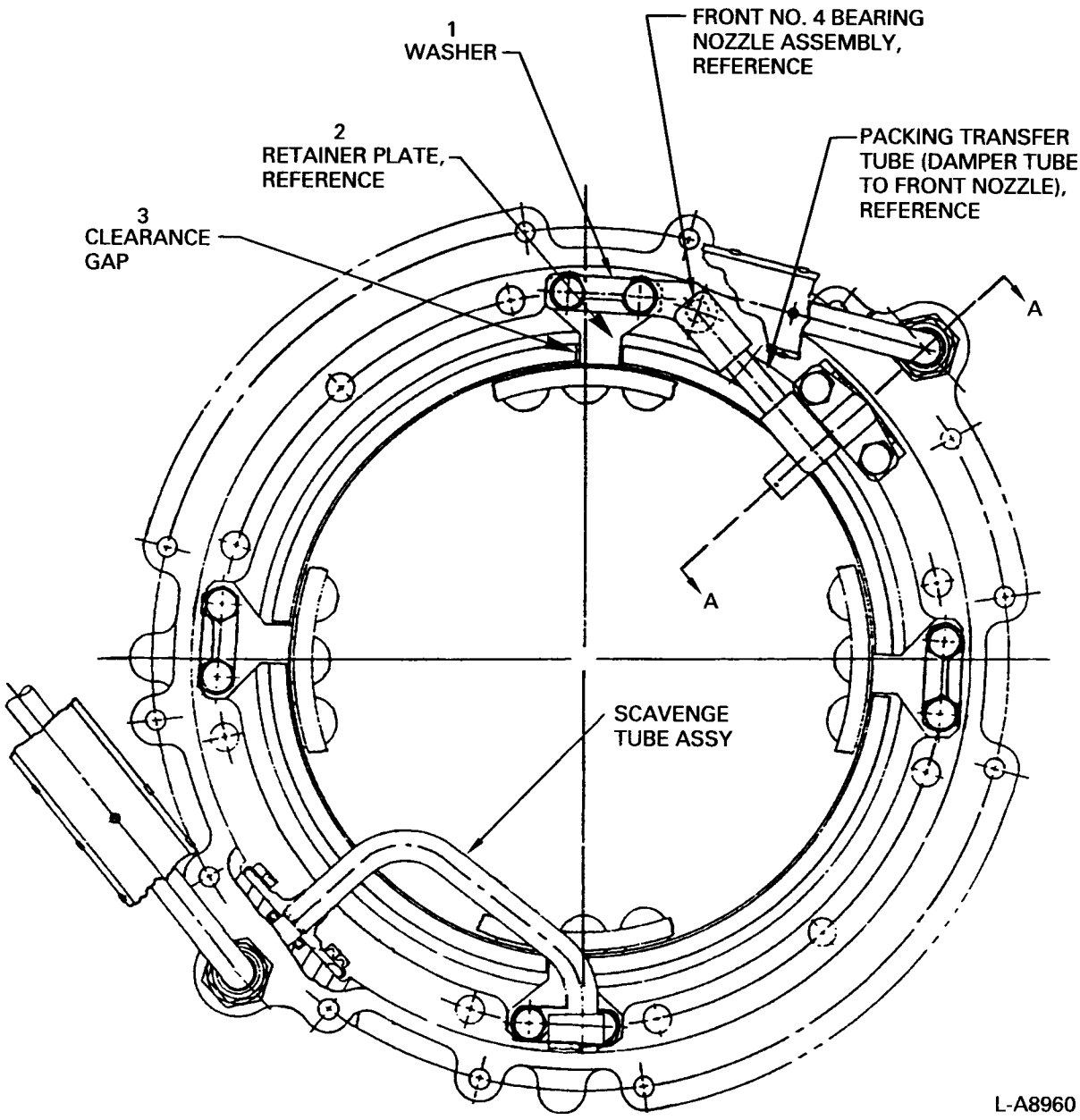
BM5 72 58 01 2 KAMO - 00

No. 4 Bearing Shield and Cover
Removal/Installation
Figure 201



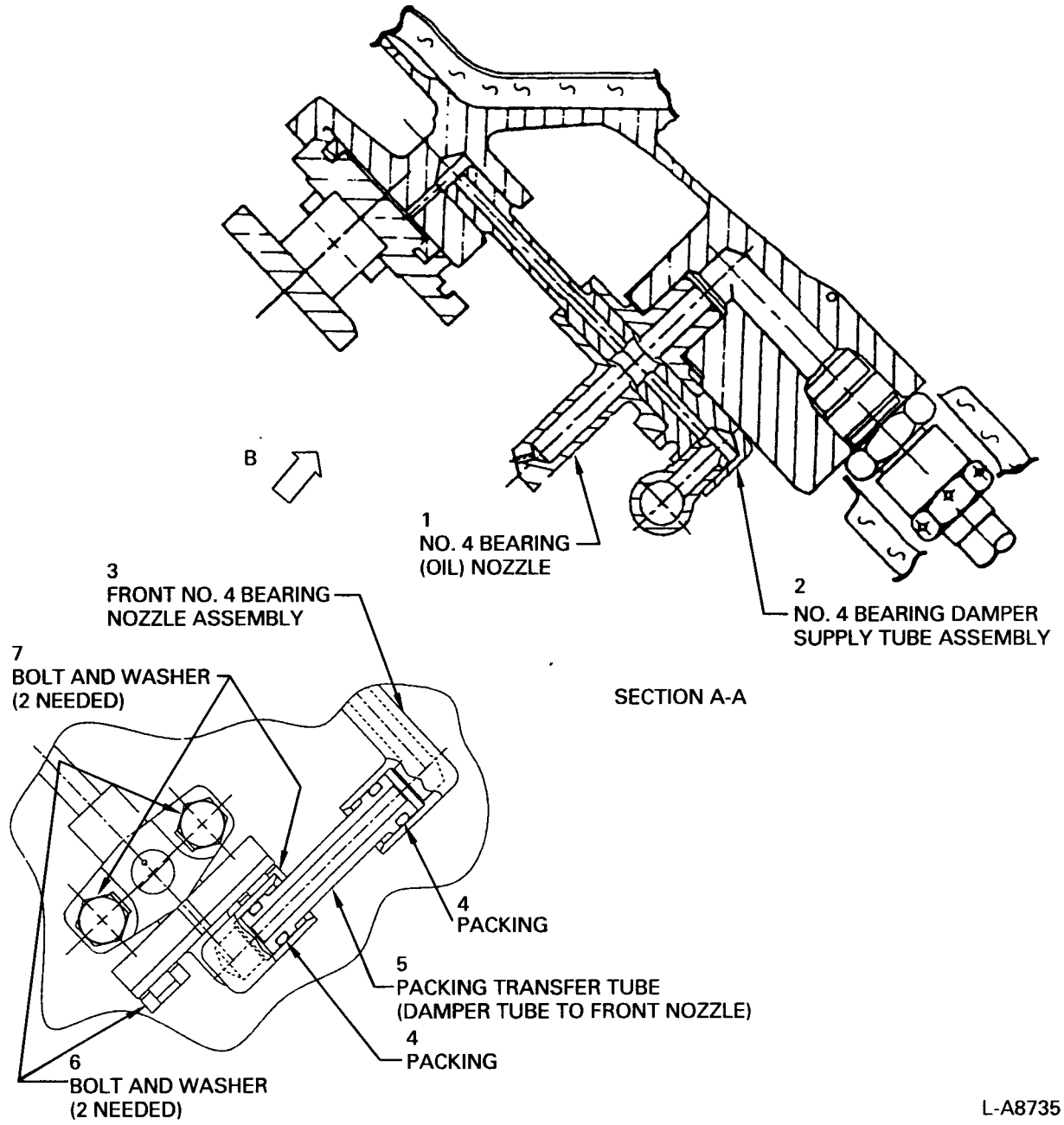
BM5 72 58 01 2 KCMO - 00

No. 4 Bearing (Oil) Nozzle
Removal/Installation (Pre SB PW4ENG 72-472)
Figure 202



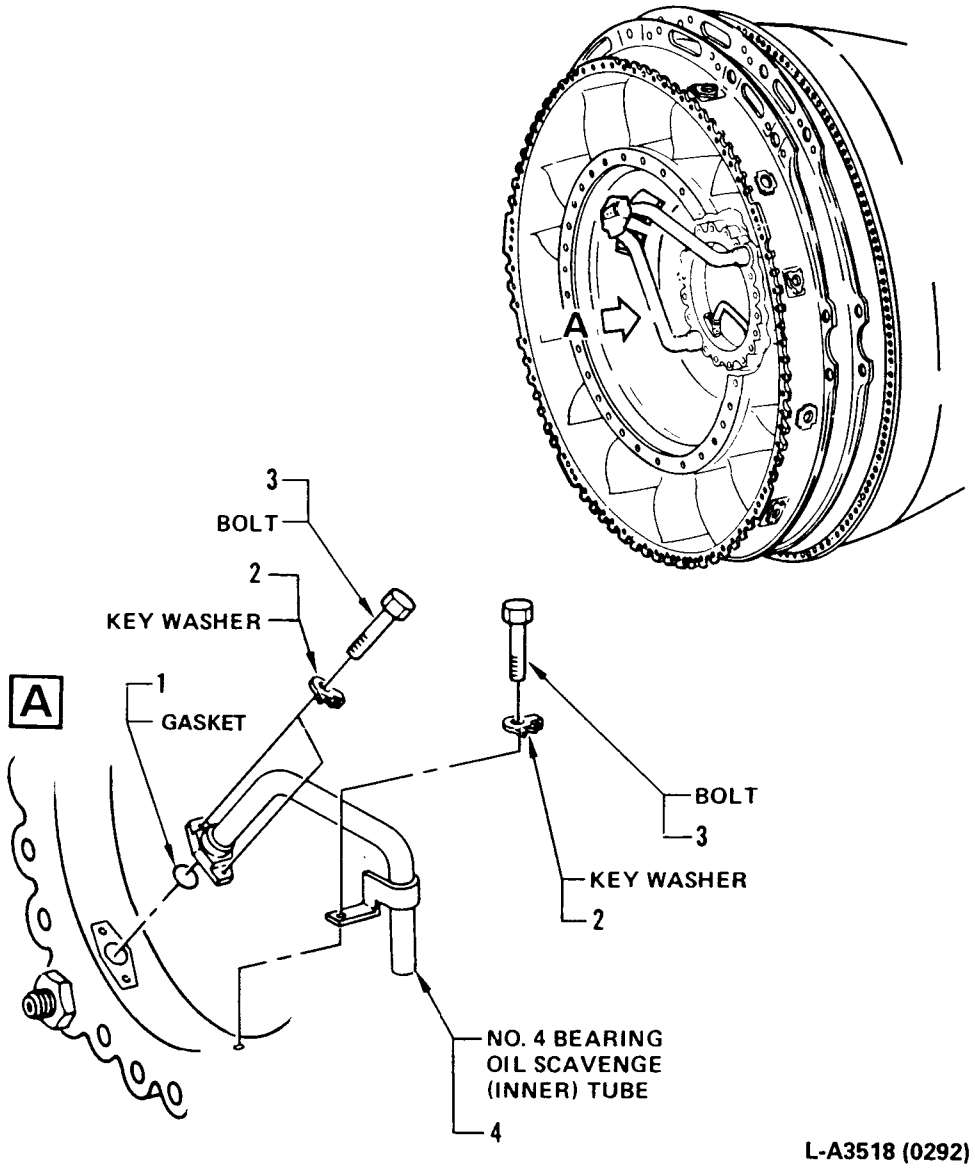
BM5 72 58 01 2 KCPA 01

No. 4 Bearing (Oil) Nozzles Removal/Installation
(Post SB PW4ENG 72-472) (Sheet 1/2)
Figure 203



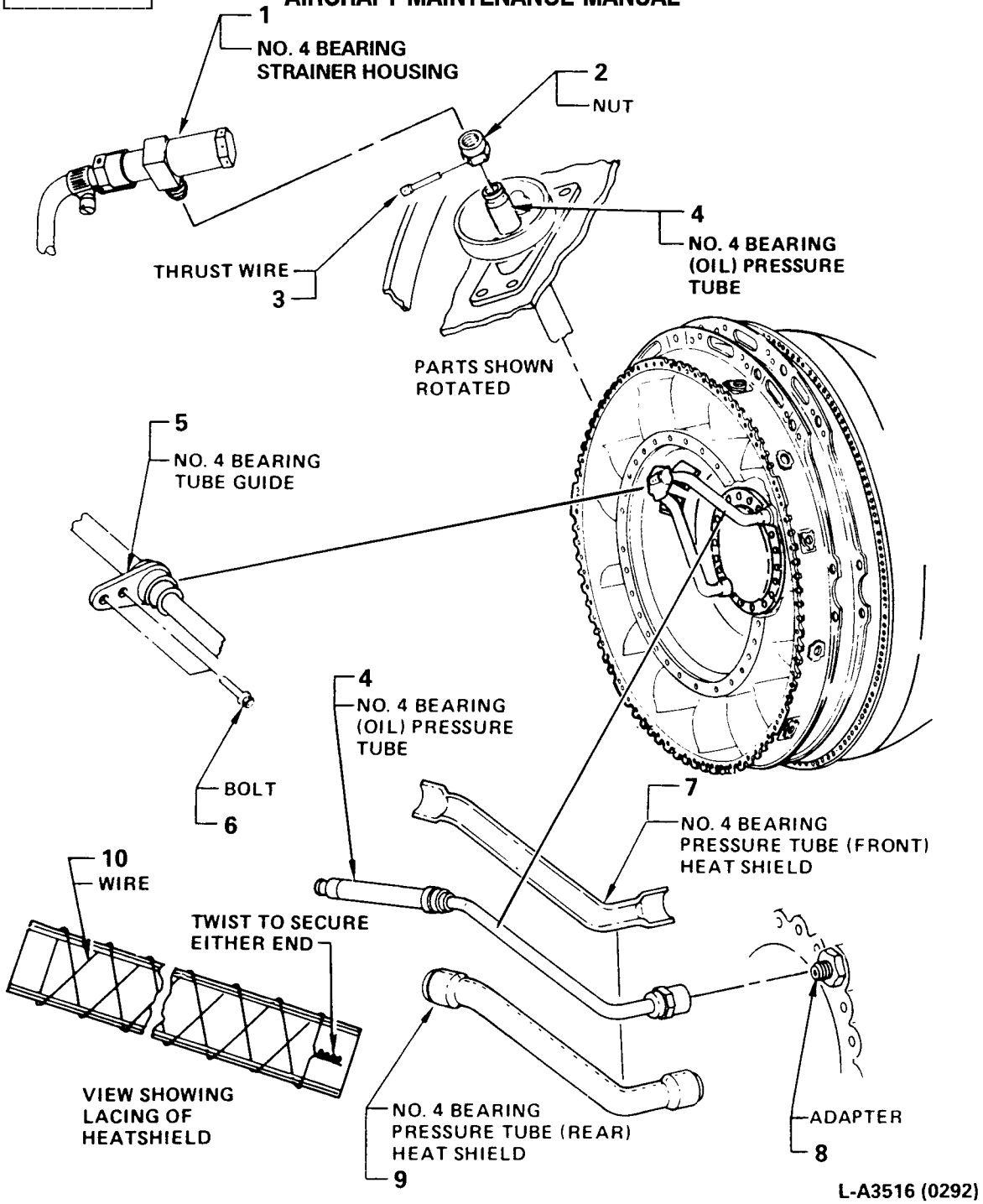
BM5 72 58 01 2 KCPC 00

No. 4 Bearing (Oil) Nozzles
Removal/Installation (Post SB PW4ENG 72-472) (Sheet 2/2)
Figure 203



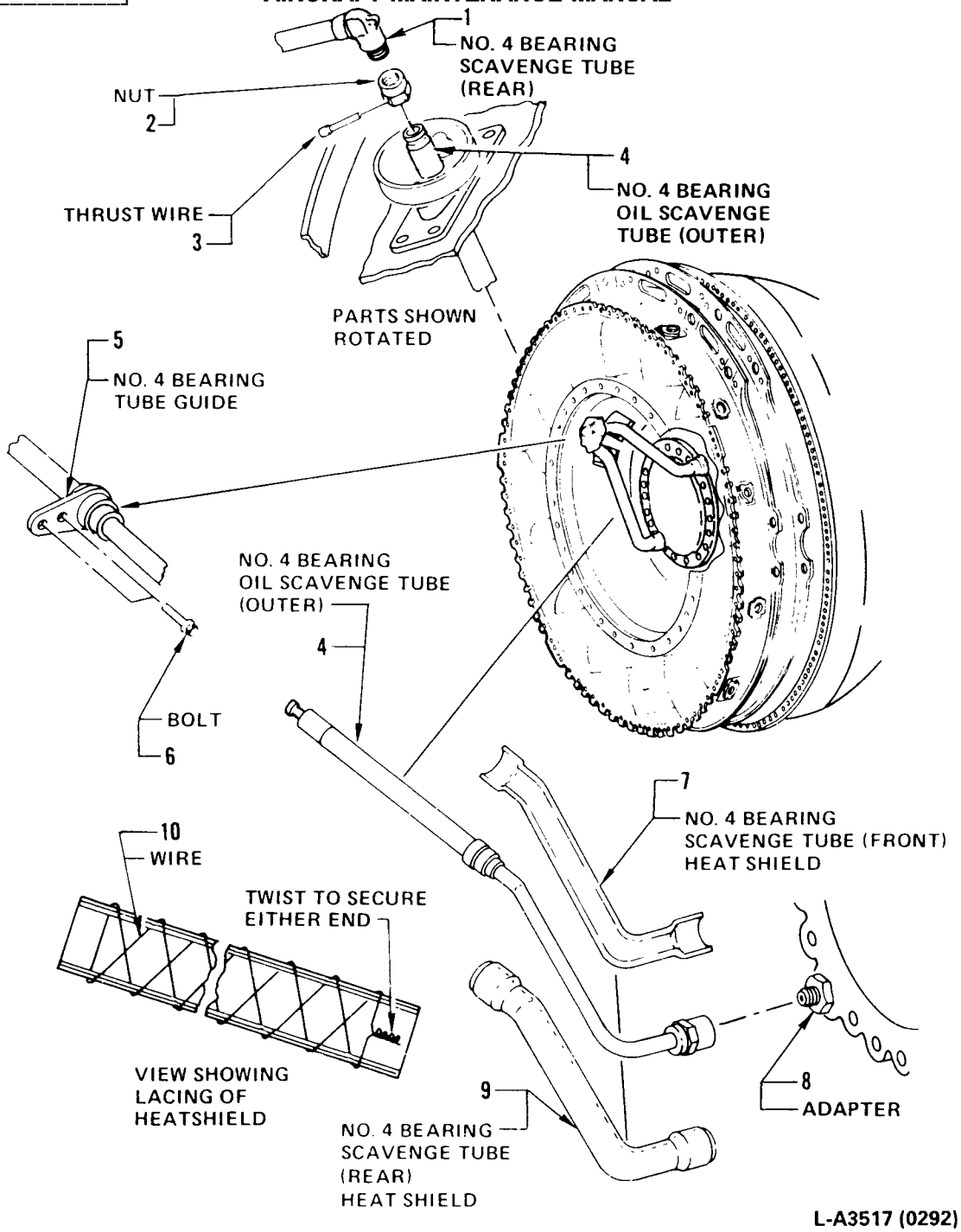
BM5 72 58 01 2 KEMO - 00

No. 4 Bearing Oil Scavenge (Inner) Tube
Removal/Installation (Pre SB PW4ENG 79-76)
Figure 204



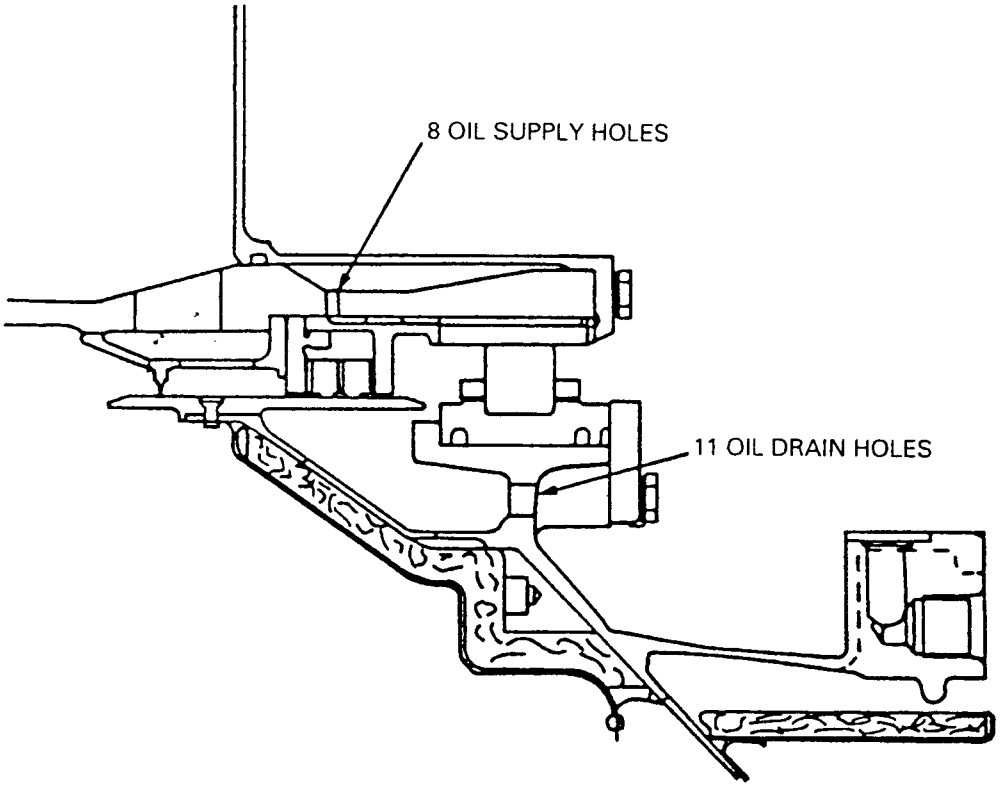
BM5 72 58 01 2 KGMO - 00

No. 4 Bearing (Oil) Pressure Tube
Removal/Installation (Pre SB PW4ENG 79-76)
Figure 205



BM5 72 58 01 2 KJMO - 00

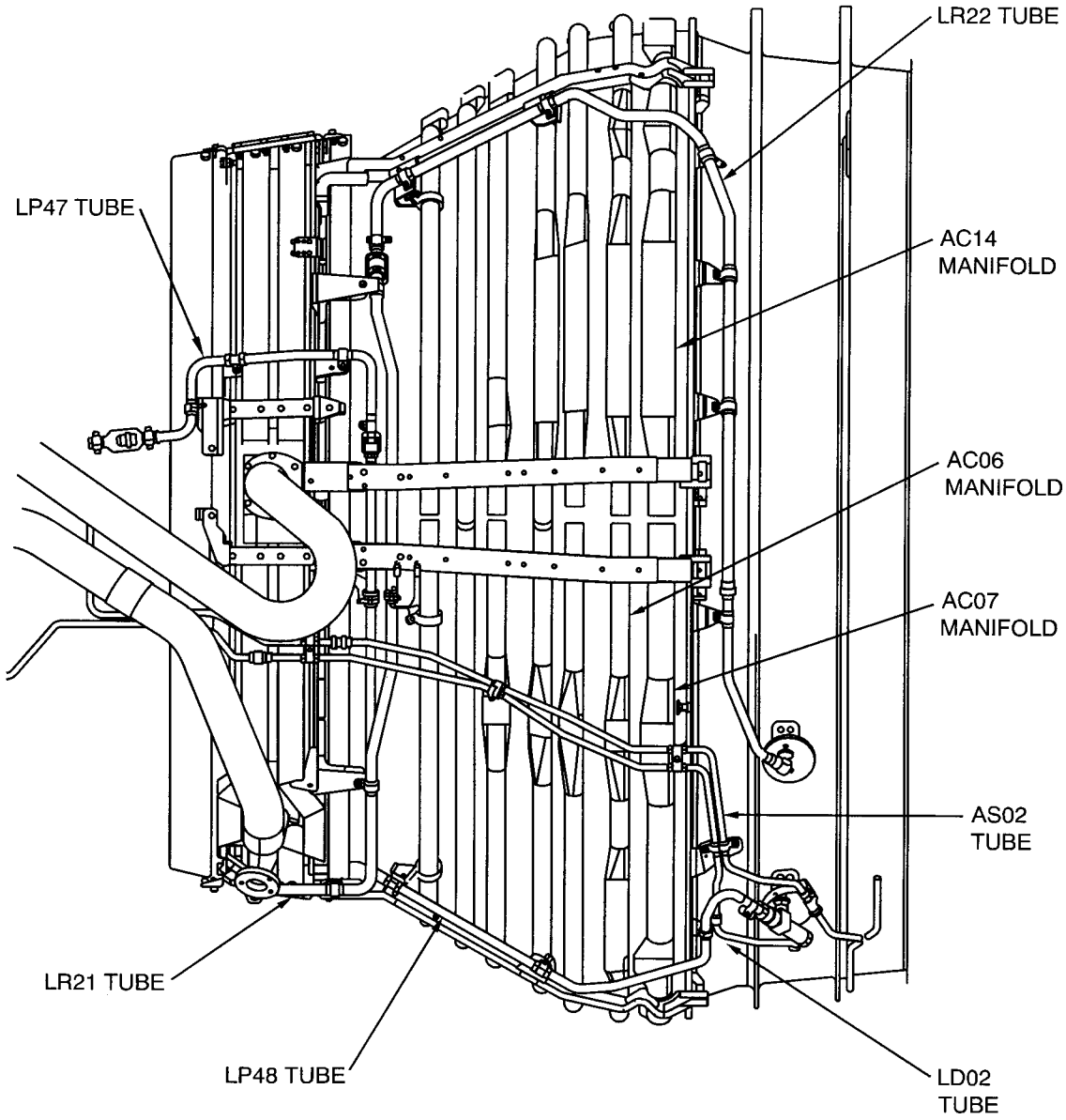
No. 4 Bearing (Oil) Scavenge Tube Outer
Removal/Installation (Pre SB PW4ENG 79-76)
Figure 206



L-A8367 (0000)

BM5 72 58 01 2 KLMO - 00

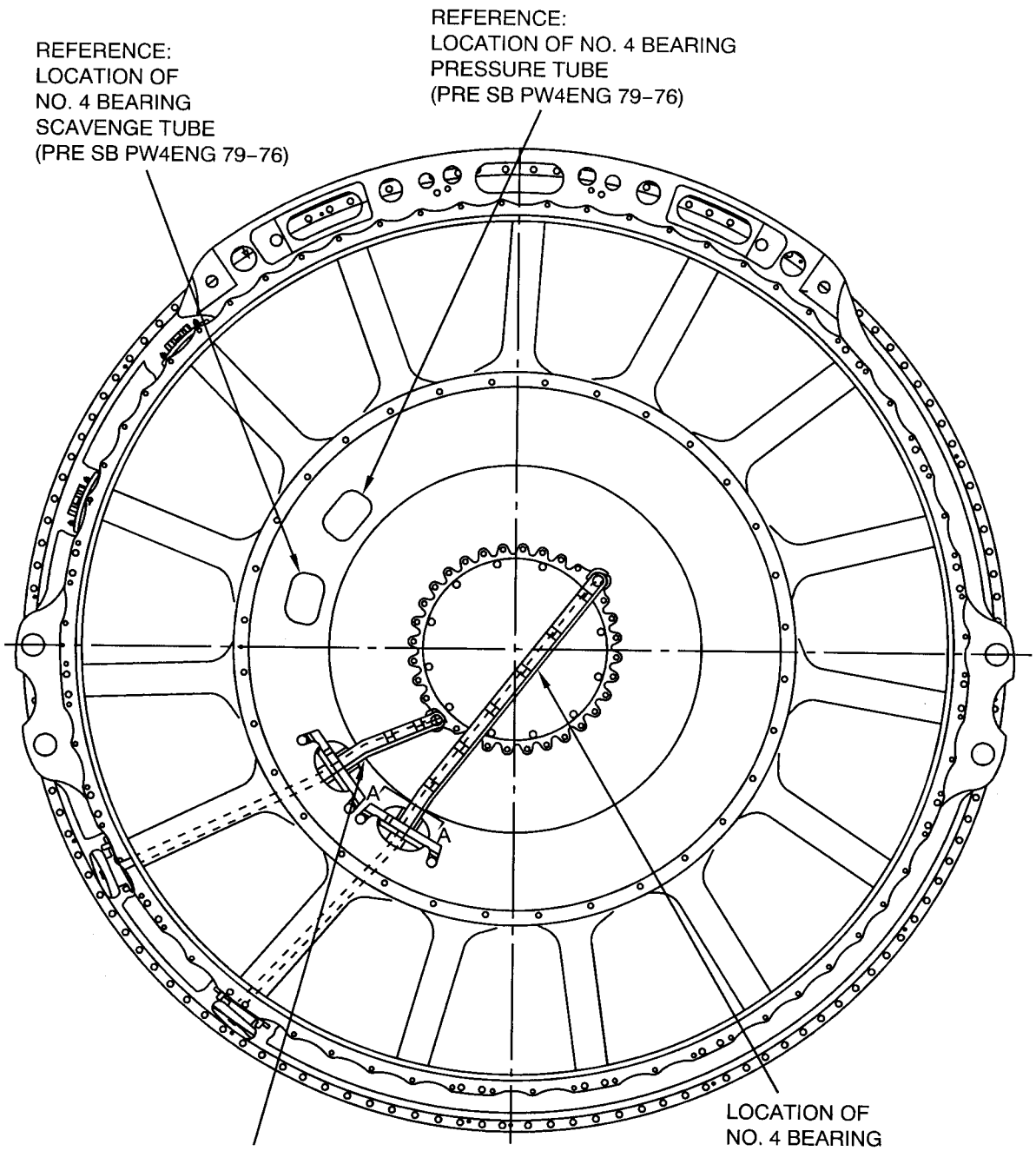
Oil Supply and Drain Hole Inspection
Figure 207



BM5 72 58 01 2 KMMA 00

Routing of the No. 4 Bearing Pressure and Scavenge Tube
(Post SB PW4ENG 79-76) (Sheet 1/2)
Figure 208

R

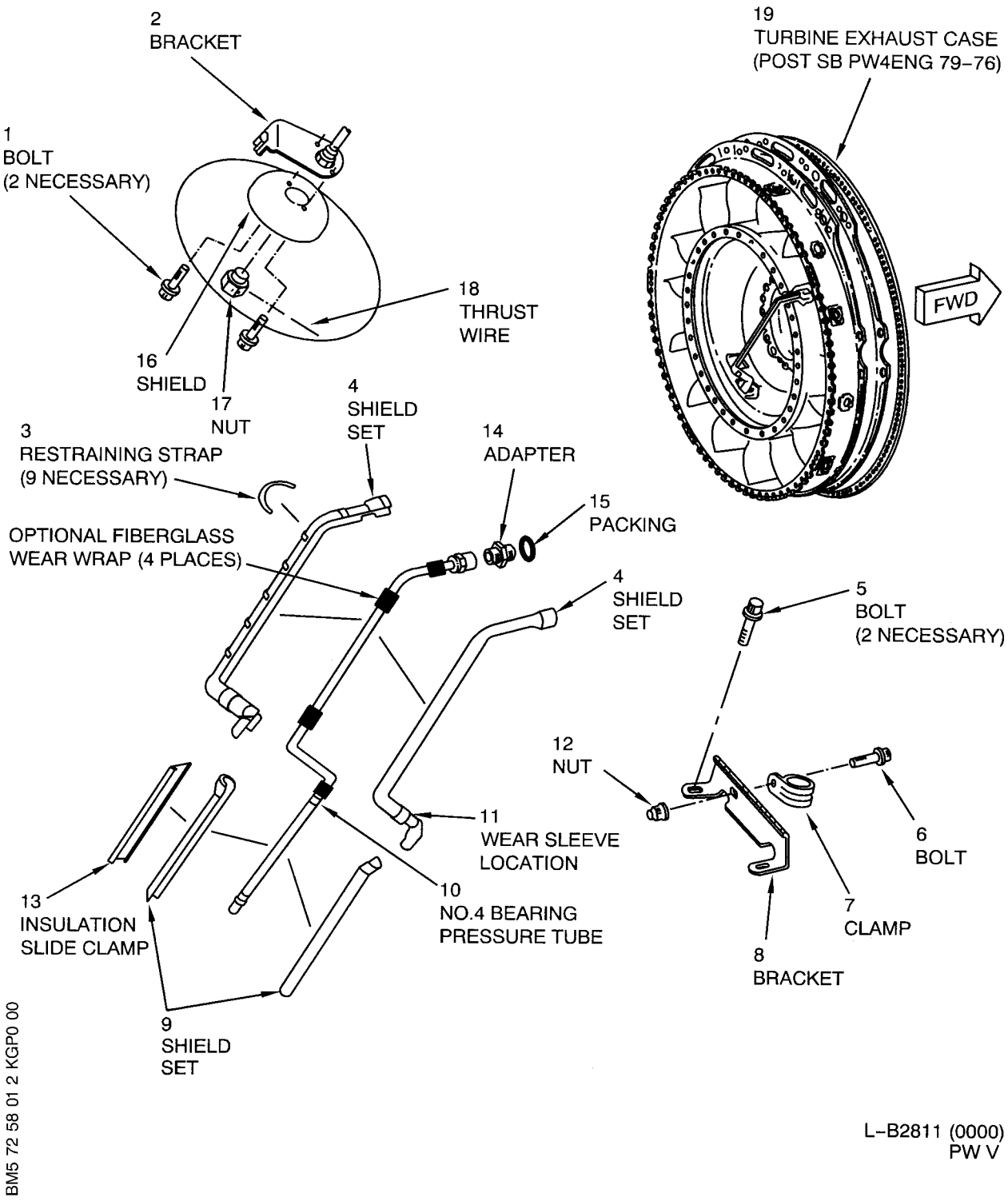


L-B2782 (0000)
PW V

BM5 72 58 01 2 KMMB 00

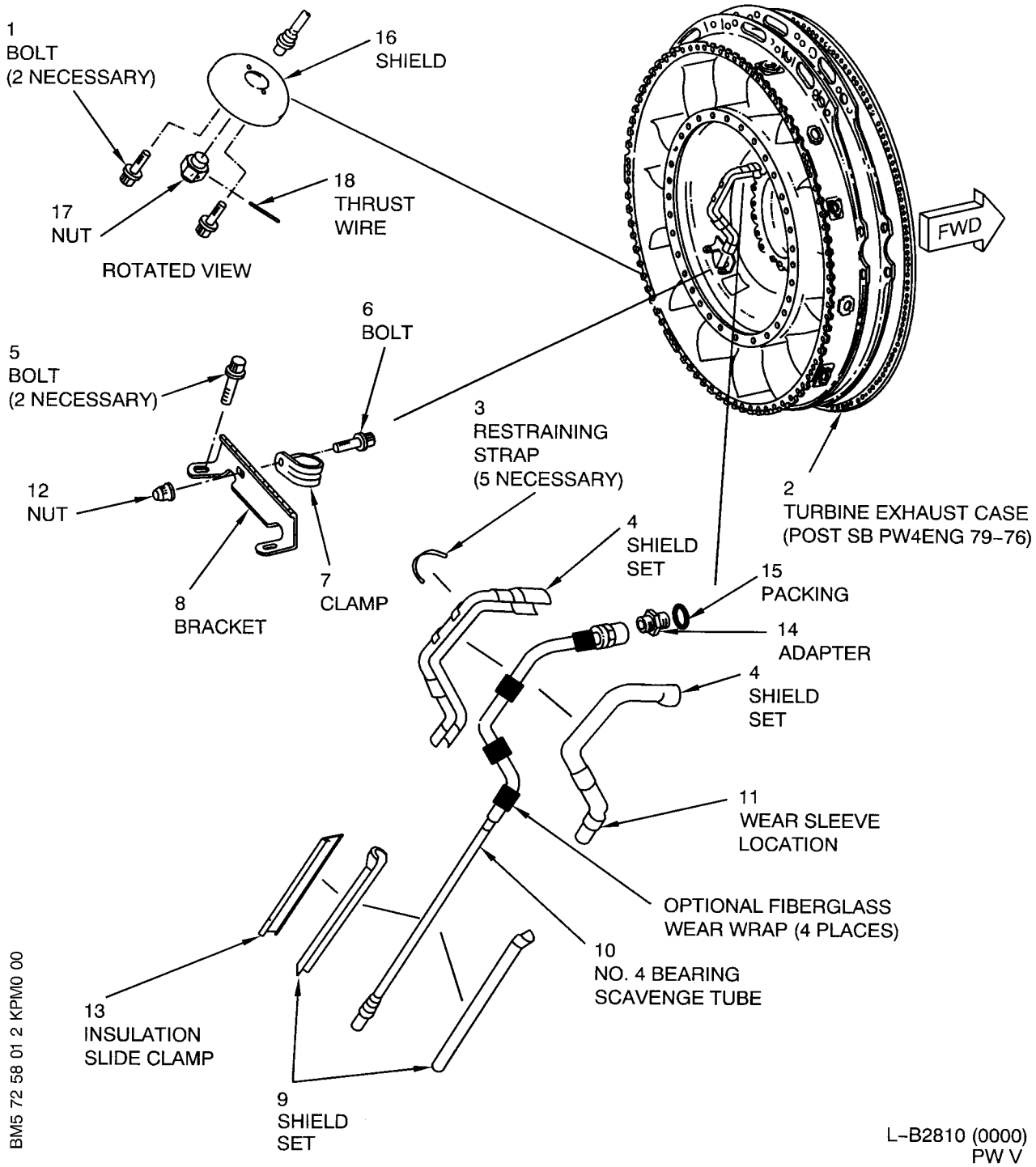
Routing of the No. 4 Bearing Pressure and Scavenge Tube
(Post SB PW4ENG 79-76) (Sheet 2/2)
Figure 208

R



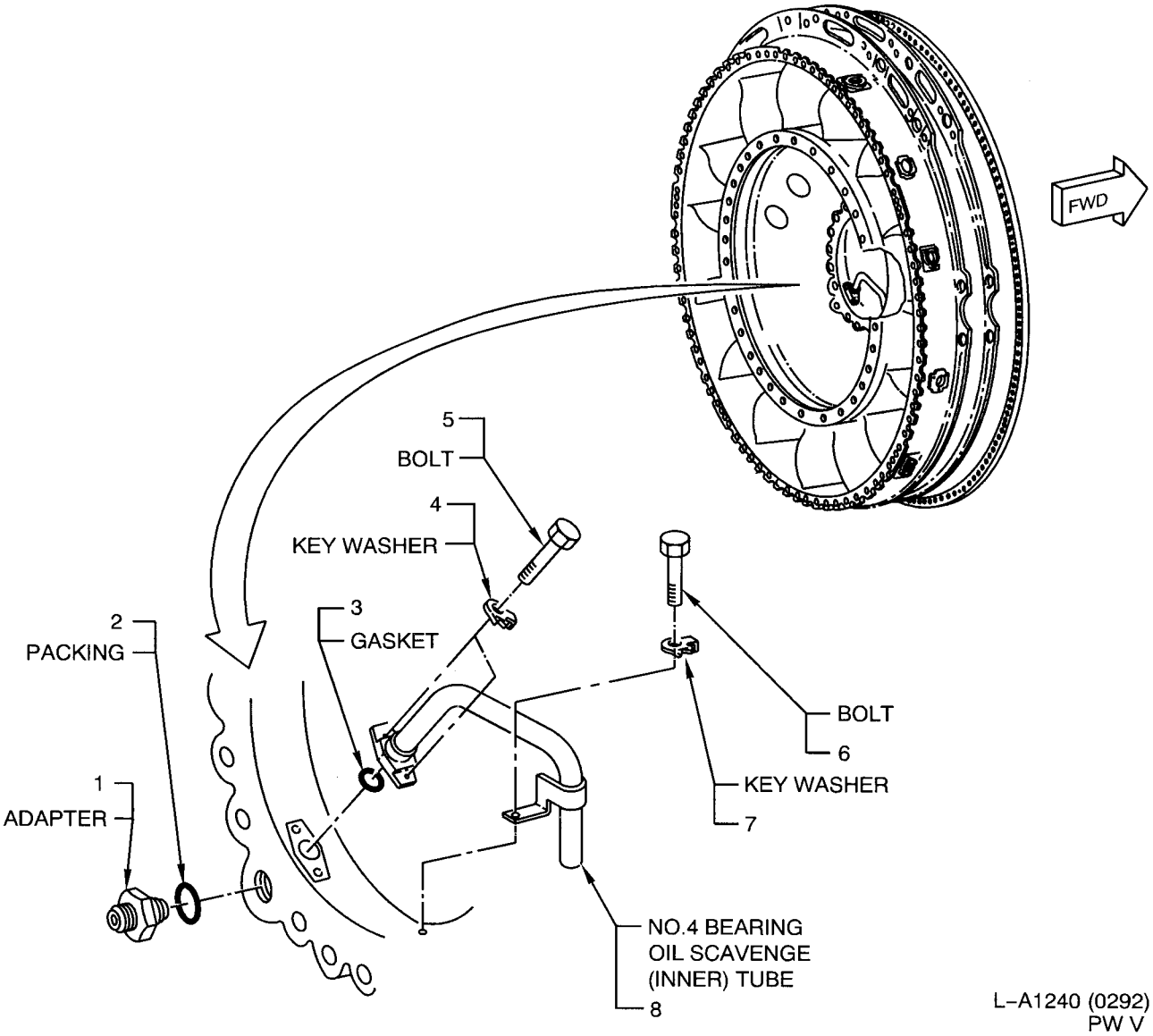
The No. 4 Bearing Pressure Tube Removal
(Post SB PW4ENG 79-76)
Figure 209

R



The No. 4 Bearing Scavenge Tube (Outer)
Removal/Installation (Post SB PW4ENG 79-76)
Figure 210

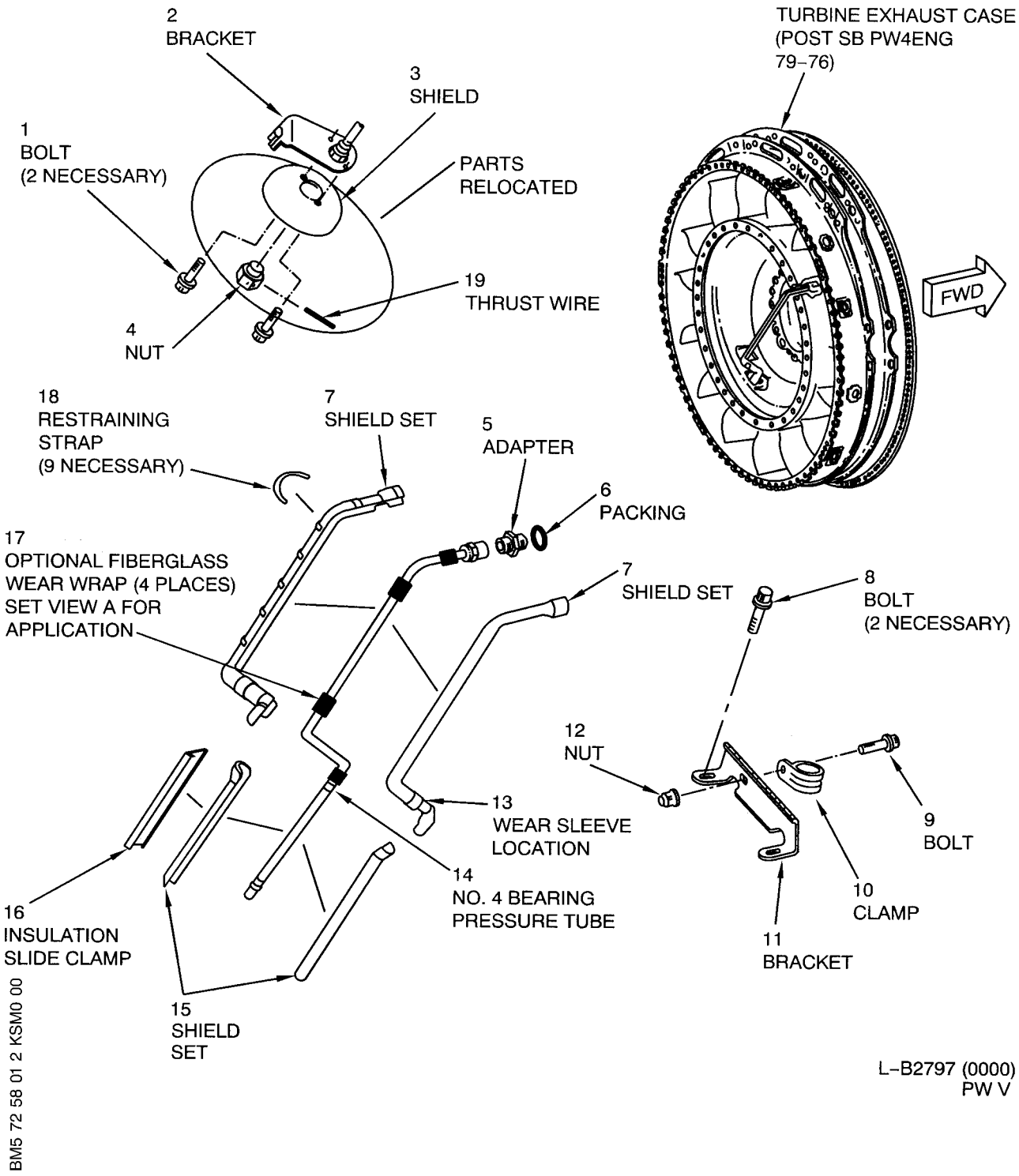
R



BM5 72 58 01 2 KRM0 00

The No. 4 Bearing Scavenge Tube
Removal/Installation (Post SB PW4ENG 79-76)
Figure 211

R



Installation of the No. 4 Bearing Pressure Tube
(Post SB PW4ENG 79-76)
Figure 212

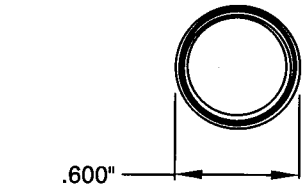
R

1. WRAP 1.00 INCH (25.400 mm) WIDE FIBERGLASS TAPE, P05-136, AT FOUR (4) LOCATIONS:

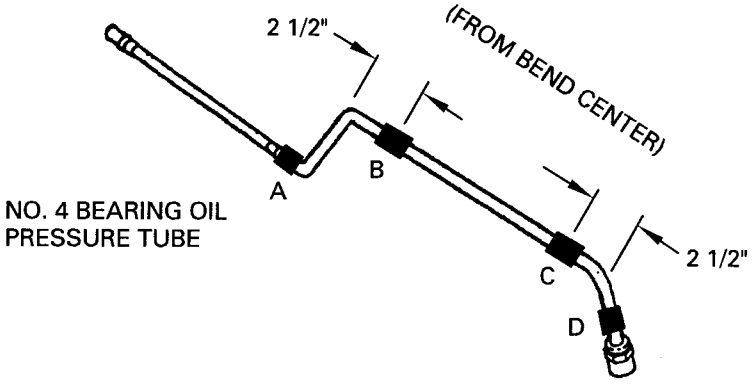
   -A & D AT TUBE ENDS AS SHOWN

   -B & C AT STRAIGHT SECTION AS SHOWN

2. WRAP TAPE TO BE 0.600 INCH DIAMETER (15.240 mm) AND ABOUT 0.100 INCH (2.54 mm) HEIGHT ABOVE TUBE SURFACE.



SECTION WITH TAPE - TYPICAL



VIEW A

L-B2800 (0000)

BM5 72 58 01 2 KTM0 00

Installation of the No. 4 Bearing Pressure Tube, Optional Chafing Wear Prevention (Post SB PW4ENG 79-76)
Figure 213

R

TURBINE EXHAUST CASE ASSEMBLY - INSPECTION/CHECK

1. General

A. The reduced inspection interval is set at half that value. These inspection intervals (hours) may be adjusted based on operator experiences and consultation with the local regulatory agency.

2. Equipement and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Access Platform
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

3. Procedure

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Install access platform.

B. Case Exterior Inspection for Cracks and Damage (Ref. Fig. 601, 602)
NOTE : All cracks should be repaired at next removal of turbine exhaust case from engine.
(1)Case rail flange inspection (Ref. Fig. 602) and see table 601.

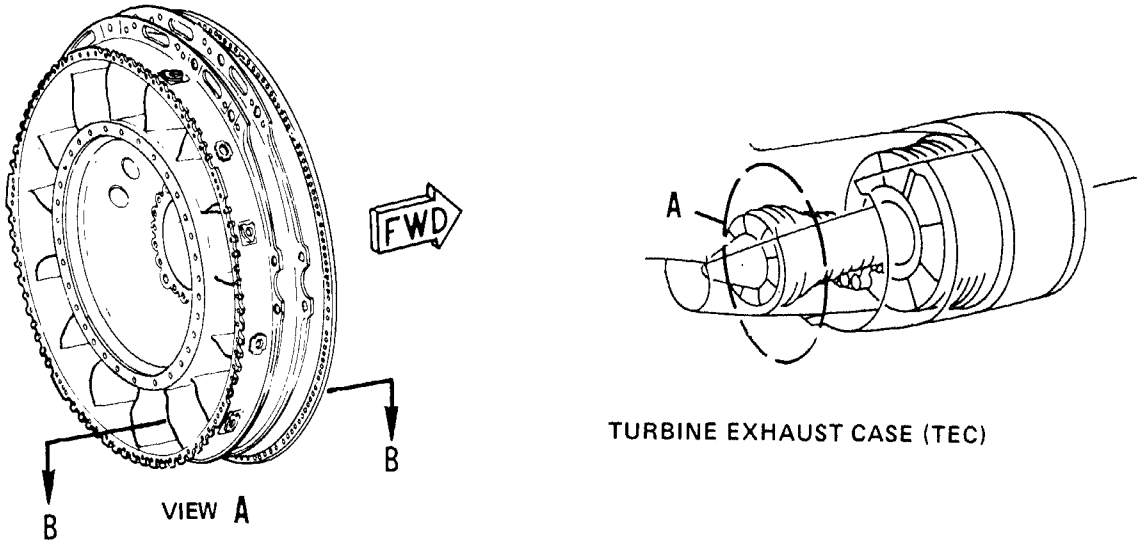
	INSPECTION AREA AND OBSERVED CONDITION	MAXIMUM DAMAGE PERMITTED FOR A REGULAR INTERVAL INSPECTION	MAXIMUM DAMAGE PERMITTED FOR A REDUCED INTERVAL INSPECTION
R	Flanges R and S Rail cracks (see NOTE 2, View B)	1. Radial or circumferential cracks to 0.75 in. (19.05 mm) in length are permitted. 2. Cracks at the same circumferential location are not permitted on adjacent rails. 3. NO circumferential or axial cracks permitted in the fillet	1. Radial or circumferential cracks to 1.5 in. (38.10 mm) length permitted. NO axial cracks into the fillet radius permitted. 2. Cracks at the same circumferential locations are NOT permitted on adjacent rails. 3. Single circumferential cracks to 1.0 in.

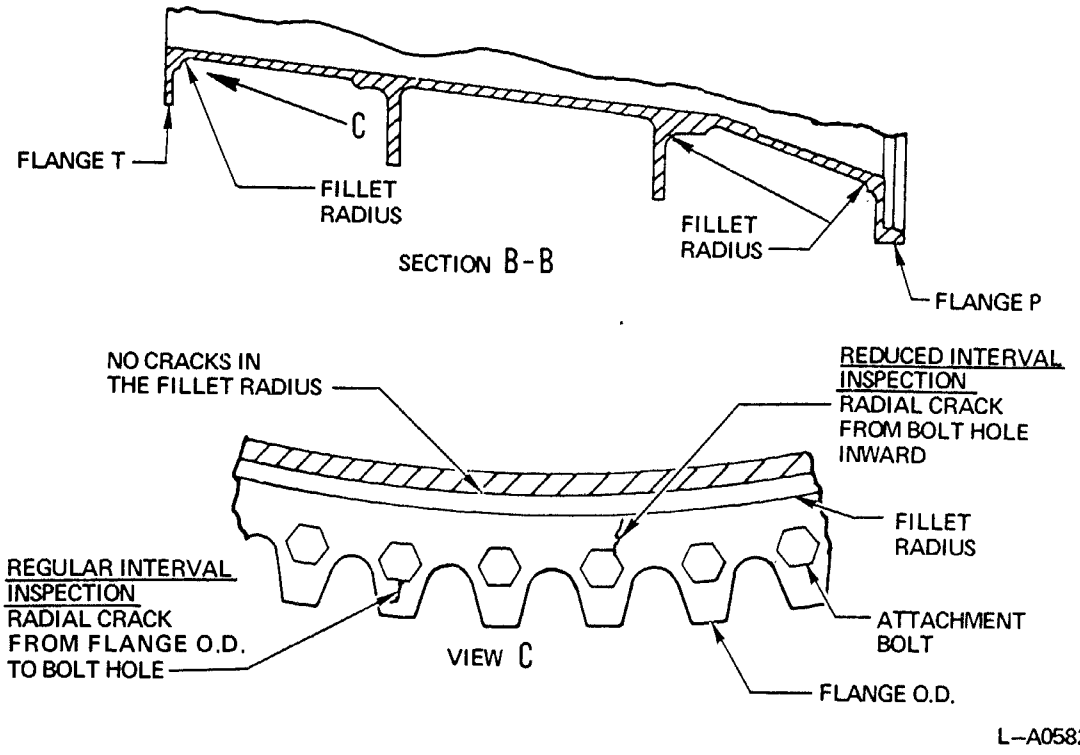
	INSPECTION AREA AND OBSERVED CONDITION	MAXIMUM DAMAGE PERMITTED FOR A REGULAR INTERVAL INSPECTION	MAXIMUM DAMAGE PERMITTED FOR A REDUCED INTERVAL INSPECTION
		radius.	(25.40 mm) confined to fillet radius permitted.
R R	Flanges R and S Engine mount ground handling mount, rail slots and through hole cracks. (See NOTE 2, View A and D)	1. A single radial crack in a slot to the rail OD is permissible.	1. A single radial or circumferential crack on the ID side of a slot or through hole is permitted to a maximum length of 1.0 in. (25.40 mm).
		2. Cracks from engine mount bushing hole or ground handling bushing holes at 10:30, 11:30, 12:30 and 1:30, 3:00 and 9:00 o'clock positions are NOT permitted.	
R	Flanges P and T, T1 OD Flanges and ID Flange T1 (See NOTE 1)	1. Radial crack from flange OD to bolt hole permitted. 2. Radial crack from the bolt hole running inward is NOT permitted.	1. Radial crack from bolt hole inward to the fillet radius is permitted. NO cracks in the filled radius.

Turbine Exhaust Case (Exterior) Inspection Limits
Table 601

R NOTE 1 : (Ref. Fig. 601).
R NOTE 2 : (Ref. Fig. 602).
(a)Visually inspect Flanges R and S for cracks and damage. Maximum permissible damage and crack conditions for Regular Interval or Reduced Interval inspections are defined in Table 601.
(2)Case outer flange inspection (Ref. Fig. 601) and see table 601.
(a)Visually inspect Flanges P and T for cracks and damage. Maximum permissible damage and crack conditions for Regular Interval or Reduced Interval inspections are defined in Table 601.

C. Turbine Exhaust Case Gaspath Area Inspection
(1)General damage - nicks, dents and cracks





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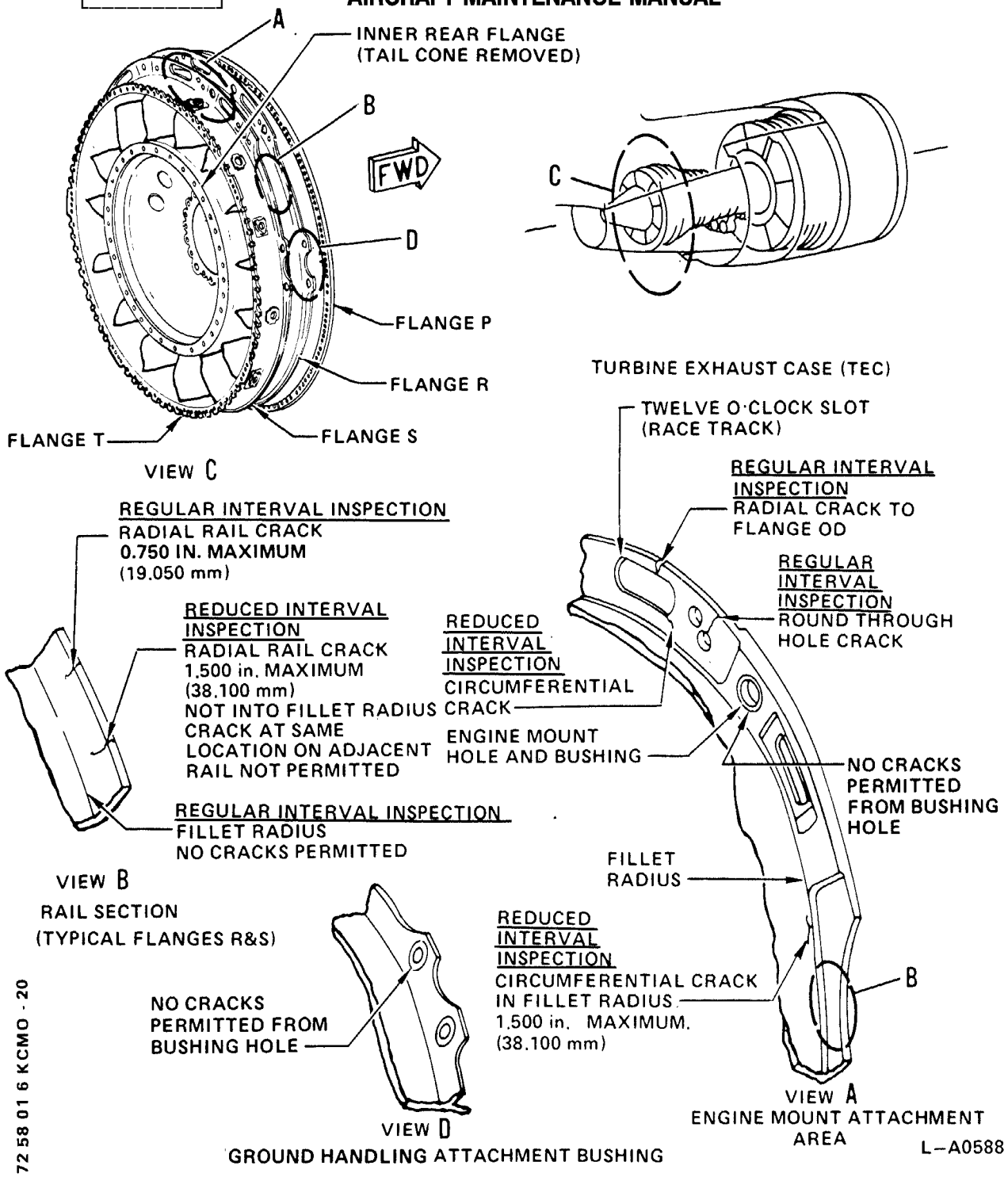
Turbine Exhaust Case Exterior Inspection
Figure 601



Turbine Exhaust Case Exterior Inspection
Figure 602

(a)Turbine exhaust case strut and duct inspection.
Turbine exhaust case struts having surface skin bulges or depressions, buckling and distorted leading and/or trailing edges may continue-in-service provided following limits are not exceeded.

1 Leading and trailing edge contours are smooth and crack limits do not exceed Paragraph (2).

2 Skin separation from strut stiffeners is not allowed.

3 Angular dents appearing as a straight line crease, holes and tears, are to be treated as cracks. Length of crease, hole or tear to be added to length of cracks when assessing acceptance.

NOTE : Acceptable cracking in vanes may allow hot exhaust gases to flow through vanes into surrounding cowled area. Inspection of engine/aircraft services (tubes and cables) in this area is recommended as part of the overall inspection for continued operation.

(2)Turbine exhaust case strut and duct crack limits
(Ref. Fig. 603, 604, 605)
(Ref. Fig. 606, 607)

(a)Turbine exhaust case struts, and OD and ID duct area crack limits are defined in table 602.

	INSPECTION AREA AND OBSERVED CONDITION	MAXIMUM DAMAGE PERMITTED FOR A REGULAR INTERVAL INSPECTION	MAXIMUM DAMAGE PERMITTED FOR A REDUCED INTERVAL INSPECTION
R		(See NOTE 3)	(See NOTE 5)
	Strut airfoil and trailing edge area for cracks	1. Three cracks maximum on a single strut over 0.75 in. (19.05 mm) 2. Radial cracks 1.25 in. (31.75 mm) maximum permitted. 3. Axial cracks through the airfoil to leading edge, 1.25 in. (31.75 mm) maximum permitted. 4. Any number of cracks under 0.75 in. (19.05 mm) confined to airfoil area only are permitted. 5. Cracks permitted to enter leading edge or fillet radius	1. Three cracks maximum on a single strut over 1.25 in. (31.75 mm). One crack maximum over 1.75 in. (44.45 mm). 2. Radial (spanwise) and axial (chordwise) cracks to a maximum of 2.5 in. (63.50 mm) in length permitted on airfoil areas. Cracks can pass through the fillet radius or leading edge. 3. NO "U" shaped cracks or impending material liberation permitted.

	INSPECTION AREA AND OBSERVED CONDITION	MAXIMUM DAMAGE PERMITTED FOR A REGULAR INTERVAL INSPECTION	MAXIMUM DAMAGE PERMITTED FOR A REDUCED INTERVAL INSPECTION
		6. NO "U" shaped cracks or impending material liberation permitted.	4. Total accumulative length of all cracks must not exceed 5 in. (127 mm).
R	Strut	(See NOTE 3)	(See NOTE 5)
	Leading edge area for cracks	1. Radial crack on , or adjacent to strut leading edge weld, to a maximum of 1.25 in. (31.75 mm). Crack must NOT enter ID or OD fillet radius.	1. Radial crack on or adjacent to strut leading edge weld to a maximum of 2.5 in. (63.50 mm) Crack can pass through the fillet radius.
		2. Axial or chordwise crack through the leading edge to the airfoil surface permissible. Length of airfoil area crack applies.	
R	Strut	(See NOTE 3)	(See NOTE 5)

INSPECTION AREA AND OBSERVED CONDITION	MAXIMUM DAMAGE PERMITTED FOR A REGULAR INTERVAL INSPECTION	MAXIMUM DAMAGE PERMITTED FOR A REDUCED INTERVAL INSPECTION
For cracks	1. Radial cracks to a maximum of two, per strut can pass through the fillet radius. The maximum length is 1.25 in. (31.75 mm) and includes any portion of the crack on the airfoil or duct surfaces.	1. Radial cracks to a maximum of two per strut can pass through the fillet radius. The maximum length is 2.5 in. (63.50 mm) and includes any portion of the crack on the airfoil or duct surfaces.
	2. Axial crack along the airfoil ID or OD weld line to 1.25 in.	2. Axial crack along the airfoil ID or OD weld line to 2.5 in.

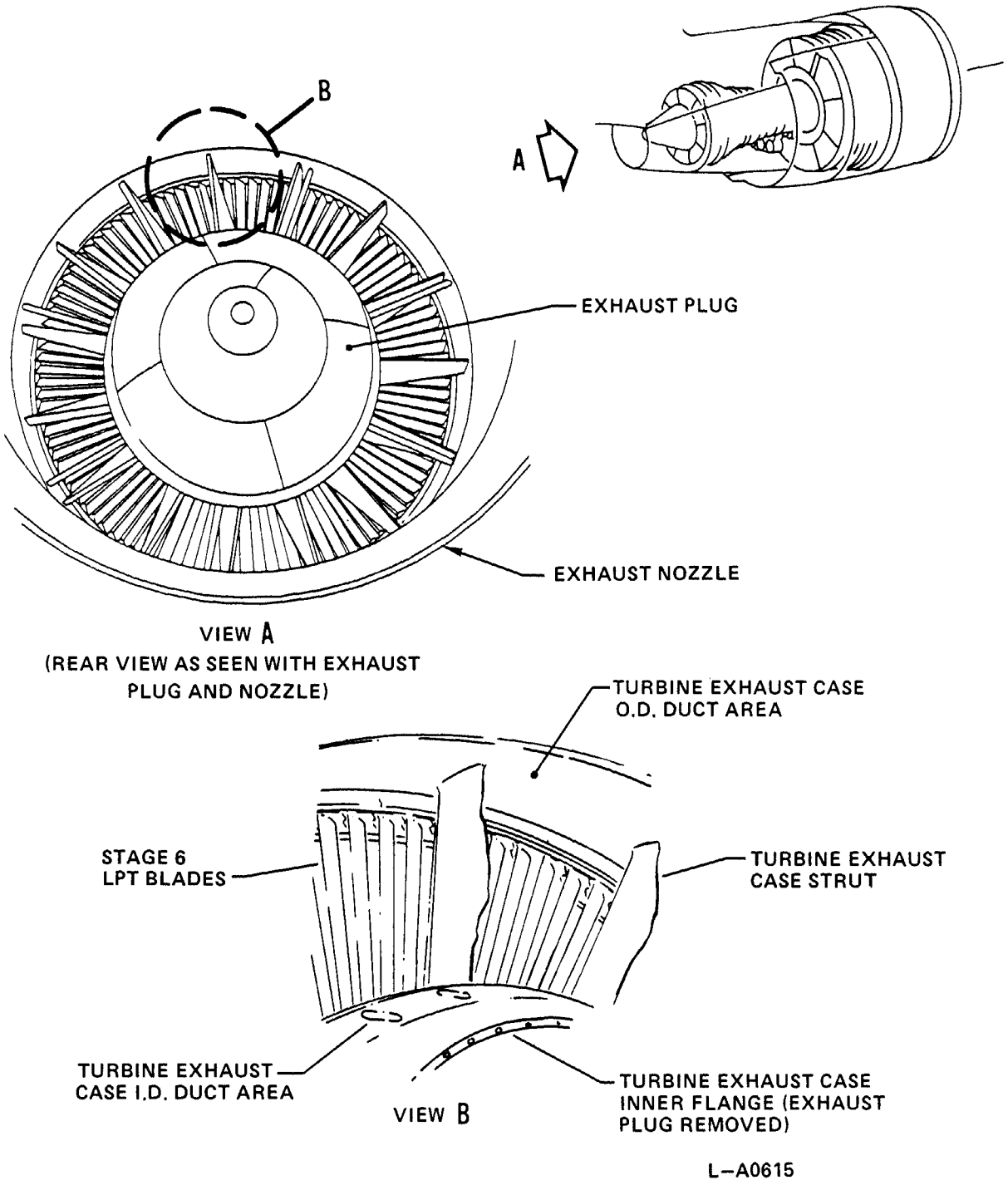
	INSPECTION AREA AND OBSERVED CONDITION	MAXIMUM DAMAGE PERMITTED FOR A REGULAR INTERVAL INSPECTION	MAXIMUM DAMAGE PERMITTED FOR A REDUCED INTERVAL INSPECTION
		(31.75 mm) maximum. One crack per strut. Crack cannot pass around leading edge.	(63.50 mm) maximum. One crack per strut. Crack can pass around leading edge.
	Struts Inner trailing edge stand-up. Area C	Crack up to 1.00 in. (25.400 mm) long from trailing edge.	Crack up to 2.00 in. (50.800 mm) long from trailing edge.
	Struts Outer trailing edge stand-up. Area D	Crack up to 1.25 in. (31.750 mm) long from trailing edge.	Crack up to 2.50 in. (63.500 mm) long from trailing edge.
R	Inner and Outer Duct Areas	(See NOTE 4)	(See NOTE 6)
	For cracks	1. Circumferential or axial cracks to a maximum length of 1.25 in. (31.75 mm). with a maximum quantity of three.	1. Circumferential or axial cracks to a maximum length of 2.5 in. (63.50 mm). with a maximum quantity of three.
		2. A continuous crack or two intersecting cracks maximum between any two struts considered to be a single crack. NO "U" shaped cracks or impending material liberation permitted.	2. A continuous crack or two intersecting cracks maximum between any two struts to be considered a single crack.
		3. Three cracks maximum between any two adjacent struts, over 0.75 in. (19.05 mm). The maximum length is 1.25 in. (31.750 mm).	3. NO "U" shaped cracks or impending material liberation is permitted.
		4. Any number of cracks under 0.75 in. (19.05 mm) confined to duct area only, are permitted.	
			5. Three cracks maximum between any two

INSPECTION AREA AND OBSERVED CONDITION	MAXIMUM DAMAGE PERMITTED FOR A REGULAR INTERVAL INSPECTION	MAXIMUM DAMAGE PERMITTED FOR A REDUCED INTERVAL INSPECTION
		struts over 1.25 in. (31.75 mm). The maximum length is 2.5 in. (63.500 mm).

Turbine Exhaust Case (Gaspath Area) Inspection Limits
Table 602

R NOTE 3 : (Ref. Fig. 604).
R NOTE 4 : (Ref. Fig. 605).
R NOTE 5 : (Ref. Fig. 606).
R NOTE 6 : (Ref. Fig. 607).

D. Close-Up
(1)Remove access platform.
(2)Close fan and thrust reverser cowl doors.
Remove safety clips and tag and close circuit breakers for the appropriate engine (Ref. 71-13-00, P. Block 301).



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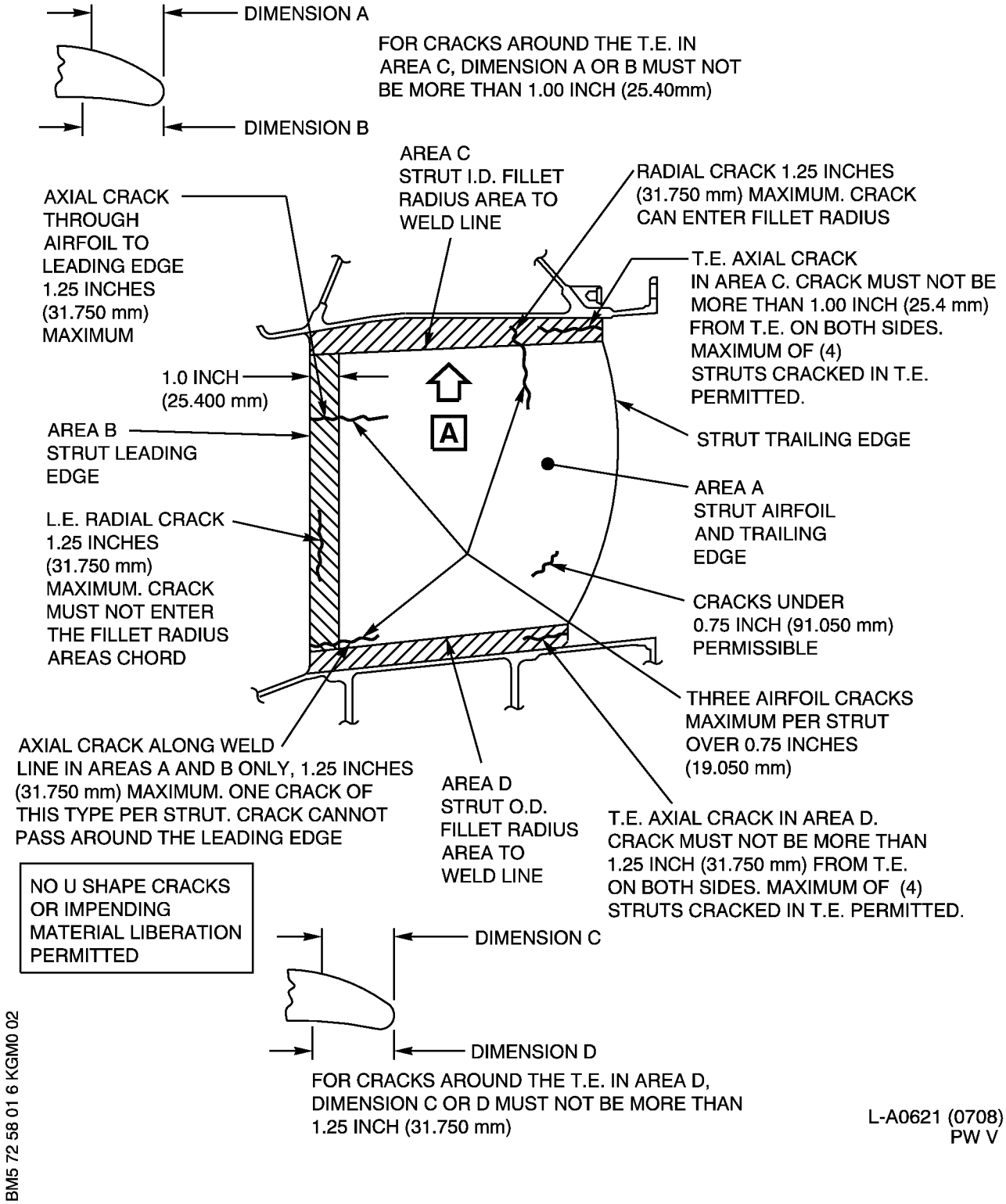
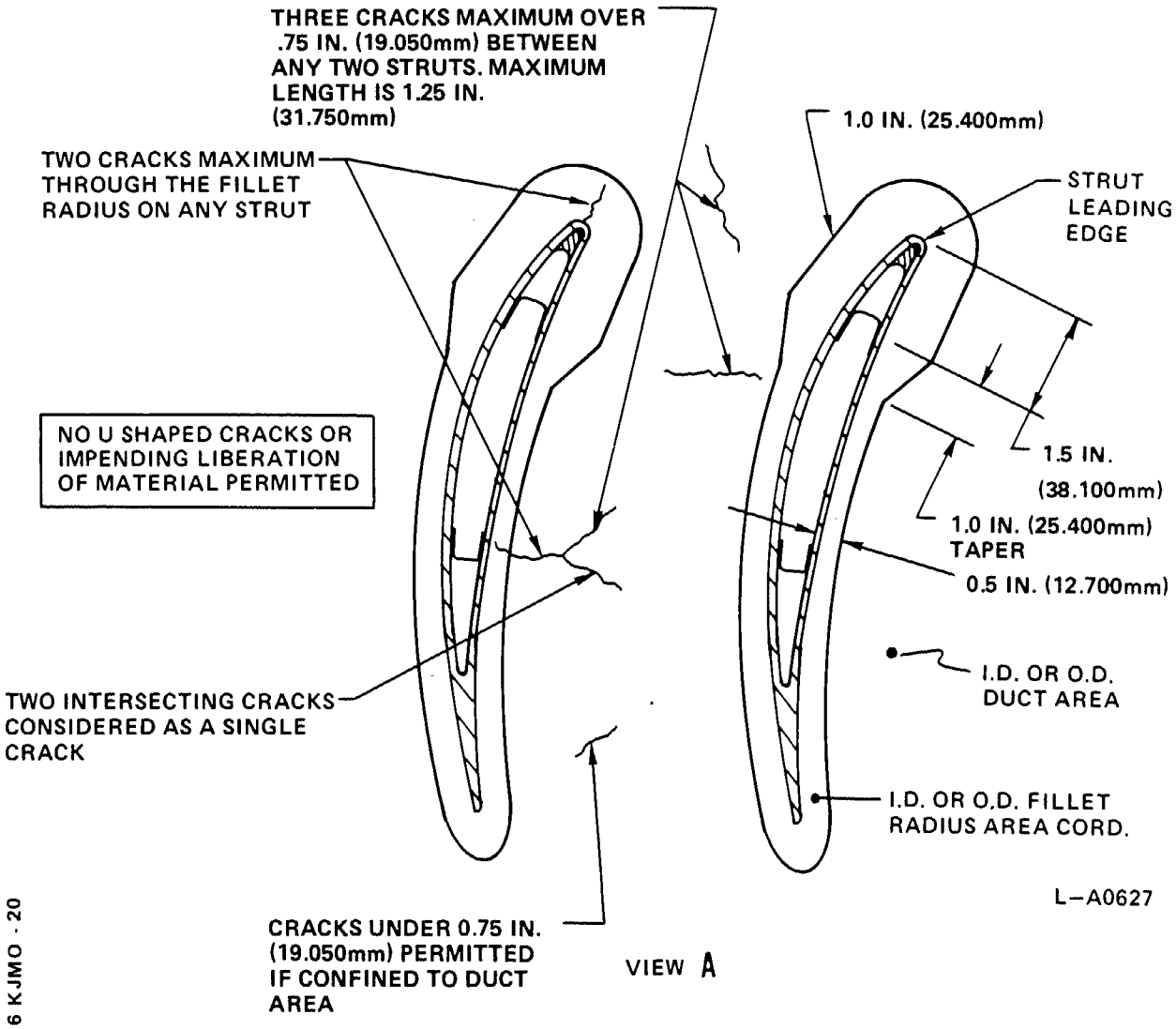
Turbine Exhaust Case Assembly Gaspath Inspection Areas
Figure 603

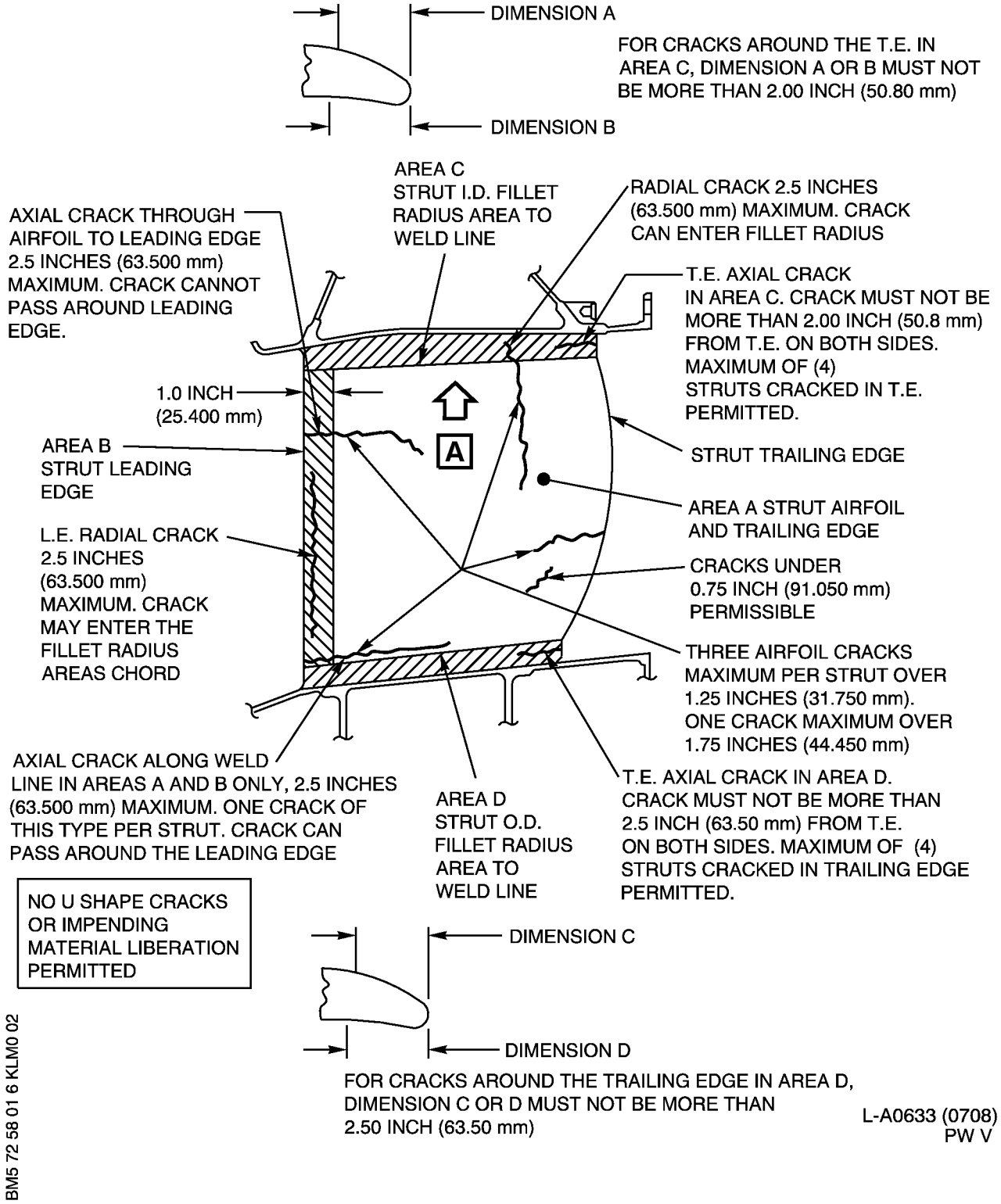

DIMENSION A
FOR CRACKS AROUND THE T.E. IN AREA C, DIMENSION A OR B MUST NOT BE MORE THAN 1.00 INCH (25.40mm)
DIMENSION B
AREA C
STRUT I.D. FILLET RADIUS AREA TO WELD LINE
RADIAL CRACK 1.25 INCHES (31.750 mm) MAXIMUM. CRACK CAN ENTER FILLET RADIUS
AXIAL CRACK THROUGH AIRFOIL TO LEADING EDGE 1.25 INCHES (31.750 mm) MAXIMUM
T.E. AXIAL CRACK IN AREA C. CRACK MUST NOT BE MORE THAN 1.00 INCH (25.4 mm) FROM T.E. ON BOTH SIDES. MAXIMUM OF (4) STRUTS CRACKED IN T.E. PERMITTED.
1.0 INCH (25.400 mm)
A
AREA B
STRUT LEADING EDGE
STRUT TRAILING EDGE
AREA A
STRUT AIRFOIL AND TRAILING EDGE
L.E. RADIAL CRACK 1.25 INCHES (31.750 mm) MAXIMUM. CRACK MUST NOT ENTER THE FILLET RADIUS AREAS CHORD
CRACKS UNDER 0.75 INCH (91.050 mm) PERMISSIBLE
THREE AIRFOIL CRACKS MAXIMUM PER STRUT OVER 0.75 INCHES (19.050 mm)
AXIAL CRACK ALONG WELD LINE IN AREAS A AND B ONLY, 1.25 INCHES (31.750 mm) MAXIMUM. ONE CRACK OF THIS TYPE PER STRUT. CRACK CANNOT PASS AROUND THE LEADING EDGE
AREA D
STRUT O.D. FILLET RADIUS AREA TO WELD LINE
T.E. AXIAL CRACK IN AREA D. CRACK MUST NOT BE MORE THAN 1.25 INCH (31.750 mm) FROM T.E. ON BOTH SIDES. MAXIMUM OF (4) STRUTS CRACKED IN T.E. PERMITTED.
NO U SHAPE CRACKS OR IMPENDING MATERIAL LIBERATION PERMITTED
DIMENSION C
DIMENSION D
FOR CRACKS AROUND THE T.E. IN AREA D, DIMENSION C OR D MUST NOT BE MORE THAN 1.25 INCH (31.750 mm)
L-A0621 (0708)
PW V
BM5 72 58 01 6 KGM0 02

Turbine Exhaust Case Regular Interval Inspection Maximum Damage
Figure 604

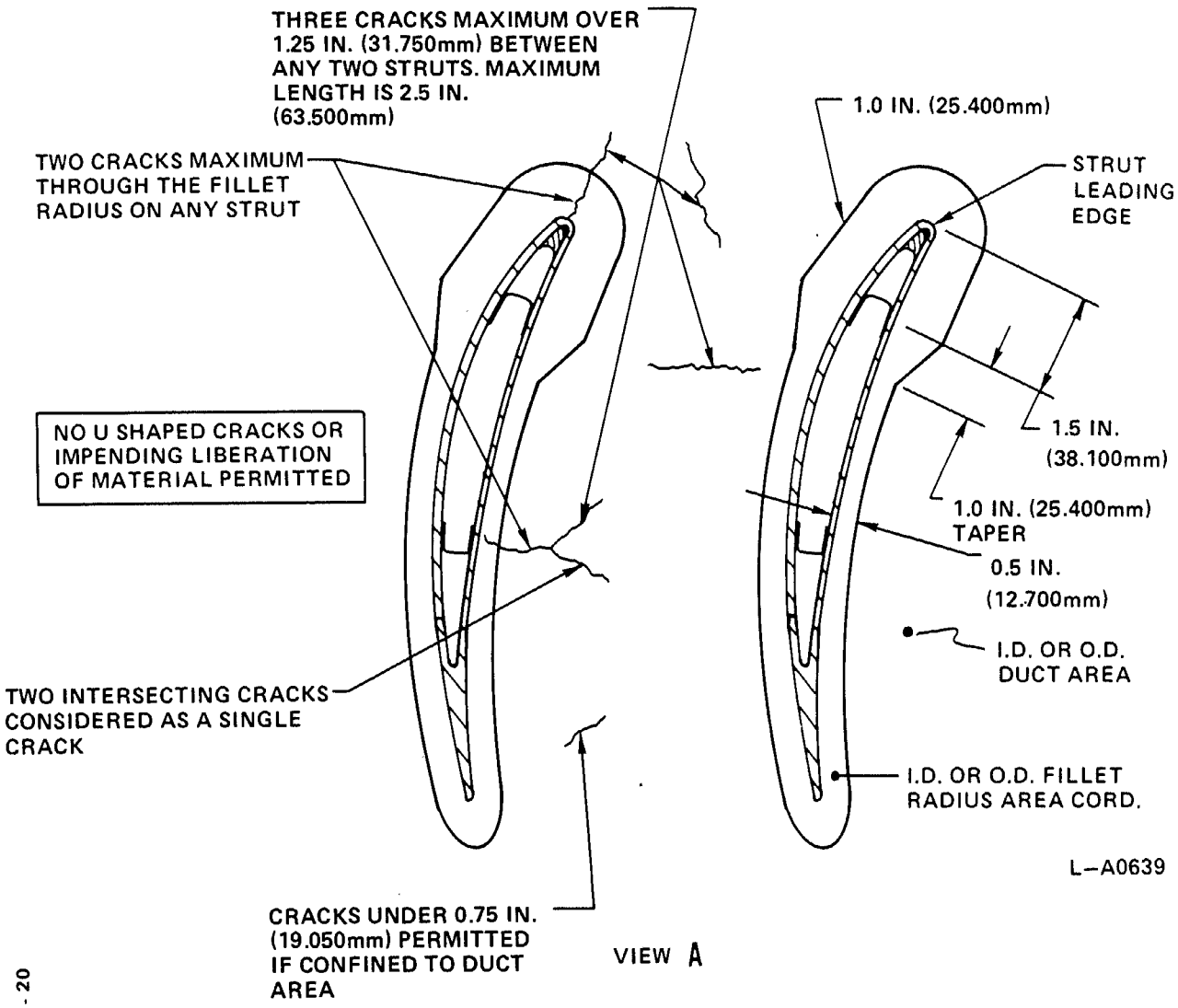
R


THREE CRACKS MAXIMUM OVER .75 IN. (19.050mm) BETWEEN ANY TWO STRUTS. MAXIMUM LENGTH IS 1.25 IN. (31.750mm)
1.0 IN. (25.400mm)
TWO CRACKS MAXIMUM THROUGH THE FILLET RADIUS ON ANY STRUT
STRUT LEADING EDGE
NO U SHAPED CRACKS OR IMPENDING LIBERATION OF MATERIAL PERMITTED
1.5 IN. (38.100mm)
1.0 IN. (25.400mm) TAPER
0.5 IN. (12.700mm)
I.D. OR O.D. DUCT AREA
TWO INTERSECTING CRACKS CONSIDERED AS A SINGLE CRACK
I.D. OR O.D. FILLET RADIUS AREA CORD.
L-A0627
CRACKS UNDER 0.75 IN. (19.050mm) PERMITTED IF CONFINED TO DUCT AREA
VIEW A
BM5 72 58 01 6 KJMO - 20

Turbine Exhaust Case Regular Interval Inspection Maximum Damage
(View A)
Figure 605


DIMENSION A
FOR CRACKS AROUND THE T.E. IN AREA C, DIMENSION A OR B MUST NOT BE MORE THAN 2.00 INCH (50.80 mm)
DIMENSION B
AREA C STRUT I.D. FILLET RADIUS AREA TO WELD LINE
AXIAL CRACK THROUGH AIRFOIL TO LEADING EDGE 2.5 INCHES (63.500 mm) MAXIMUM. CRACK CANNOT PASS AROUND LEADING EDGE.
RADIAL CRACK 2.5 INCHES (63.500 mm) MAXIMUM. CRACK CAN ENTER FILLET RADIUS
T.E. AXIAL CRACK IN AREA C. CRACK MUST NOT BE MORE THAN 2.00 INCH (50.8 mm) FROM T.E. ON BOTH SIDES. MAXIMUM OF (4) STRUTS CRACKED IN T.E. PERMITTED.
1.0 INCH (25.400 mm)
A
AREA B STRUT LEADING EDGE
STRUT TRAILING EDGE
AREA A STRUT AIRFOIL AND TRAILING EDGE
L.E. RADIAL CRACK 2.5 INCHES (63.500 mm) MAXIMUM. CRACK MAY ENTER THE FILLET RADIUS AREAS CHORD
CRACKS UNDER 0.75 INCH (91.050 mm) PERMISSIBLE
THREE AIRFOIL CRACKS MAXIMUM PER STRUT OVER 1.25 INCHES (31.750 mm). ONE CRACK MAXIMUM OVER 1.75 INCHES (44.450 mm)
AXIAL CRACK ALONG WELD LINE IN AREAS A AND B ONLY, 2.5 INCHES (63.500 mm) MAXIMUM. ONE CRACK OF THIS TYPE PER STRUT. CRACK CAN PASS AROUND THE LEADING EDGE
AREA D STRUT O.D. FILLET RADIUS AREA TO WELD LINE
T.E. AXIAL CRACK IN AREA D. CRACK MUST NOT BE MORE THAN 2.5 INCH (63.50 mm) FROM T.E. ON BOTH SIDES. MAXIMUM OF (4) STRUTS CRACKED IN TRAILING EDGE PERMITTED.
NO U SHAPE CRACKS OR IMPENDING MATERIAL LIBERATION PERMITTED
DIMENSION C
DIMENSION D
FOR CRACKS AROUND THE TRAILING EDGE IN AREA D, DIMENSION C OR D MUST NOT BE MORE THAN 2.50 INCH (63.50 mm)
L-A0633 (0708)
PW V
BM5 72 58 01 6 KLM0 02

Turbine Exhaust Case Regular Interval Inspection Maximum Damage
Figure 606

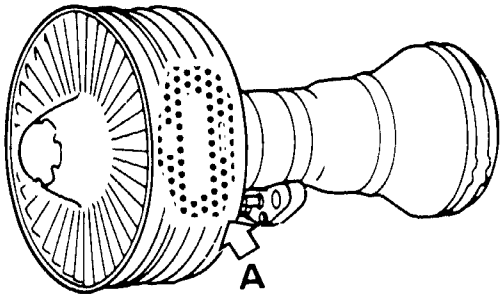

THREE CRACKS MAXIMUM OVER 1.25 IN. (31.750mm) BETWEEN ANY TWO STRUTS. MAXIMUM LENGTH IS 2.5 IN. (63.500mm)
1.0 IN. (25.400mm)
TWO CRACKS MAXIMUM THROUGH THE FILLET RADIUS ON ANY STRUT
STRUT LEADING EDGE
NO U SHAPED CRACKS OR IMPENDING LIBERATION OF MATERIAL PERMITTED
1.5 IN. (38.100mm)
1.0 IN. (25.400mm) TAPER
0.5 IN. (12.700mm)
I.D. OR O.D. DUCT AREA
TWO INTERSECTING CRACKS CONSIDERED AS A SINGLE CRACK
I.D. OR O.D. FILLET RADIUS AREA CORD.
L-A0639
CRACKS UNDER 0.75 IN. (19.050mm) PERMITTED IF CONFINED TO DUCT AREA
VIEW A

BM5 72 58 01 6 KNMO - 20

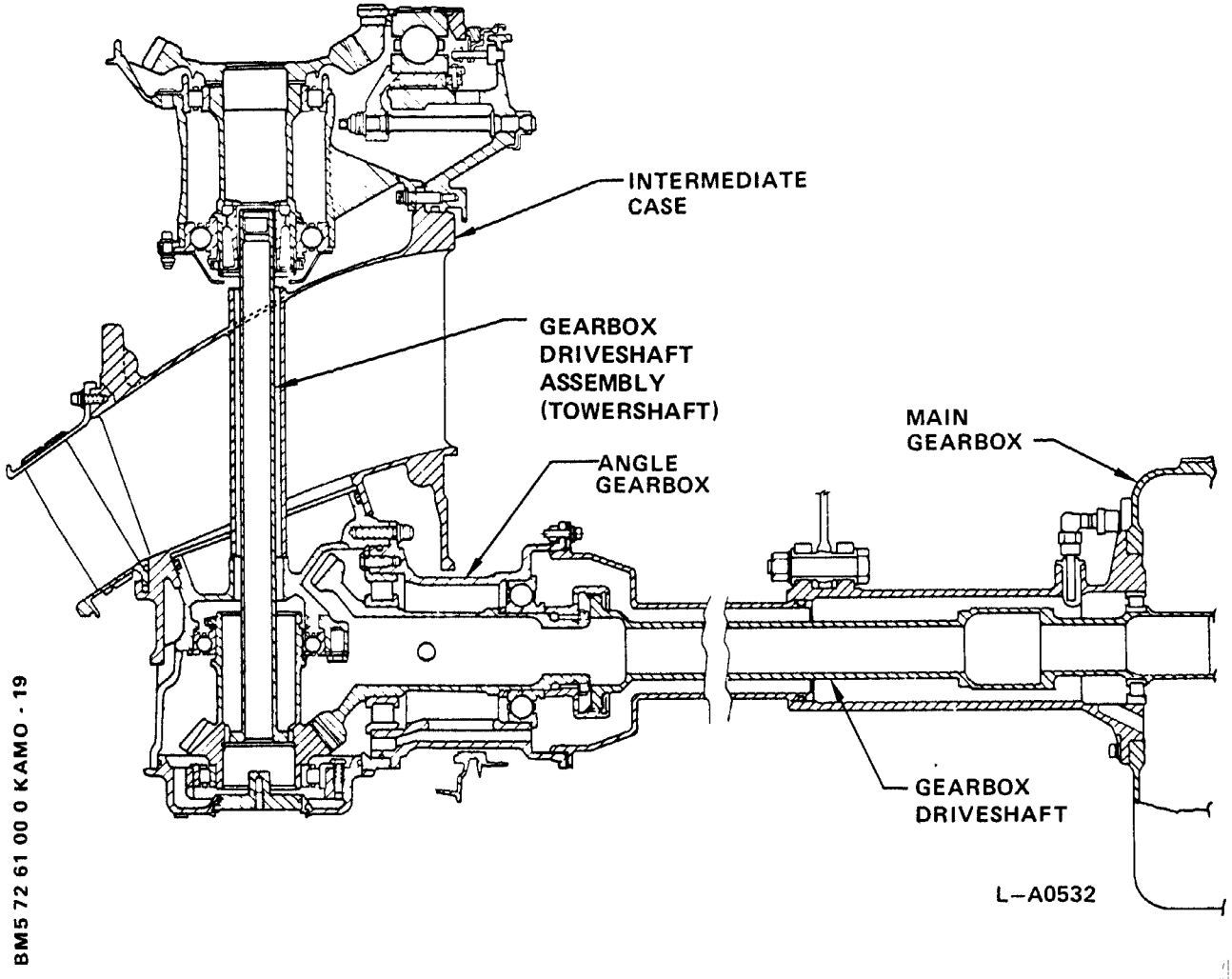
Turbine Exhaust Case Regular Interval Inspection Maximum Damage
(View A)
Figure 607

INLET GEARBOX ASSEMBLY - DESCRIPTION AND OPERATION

1. Description (Ref. Fig. 001)
   Main gearbox power to drive the engine and aircraft supplied accessories is obtained from the High Pressure Compressor rotor (HPC). A towershaft in the intermediate case is geared to front of the rotor.
   The towershaft drives the angle gearbox bevel gear set which transmits power to the main gearbox group through the gearbox driveshaft assembly. The angle gearbox is located in the intermediate case group completely enclosed between the fan exit case rear and the intermediate case OD wall.



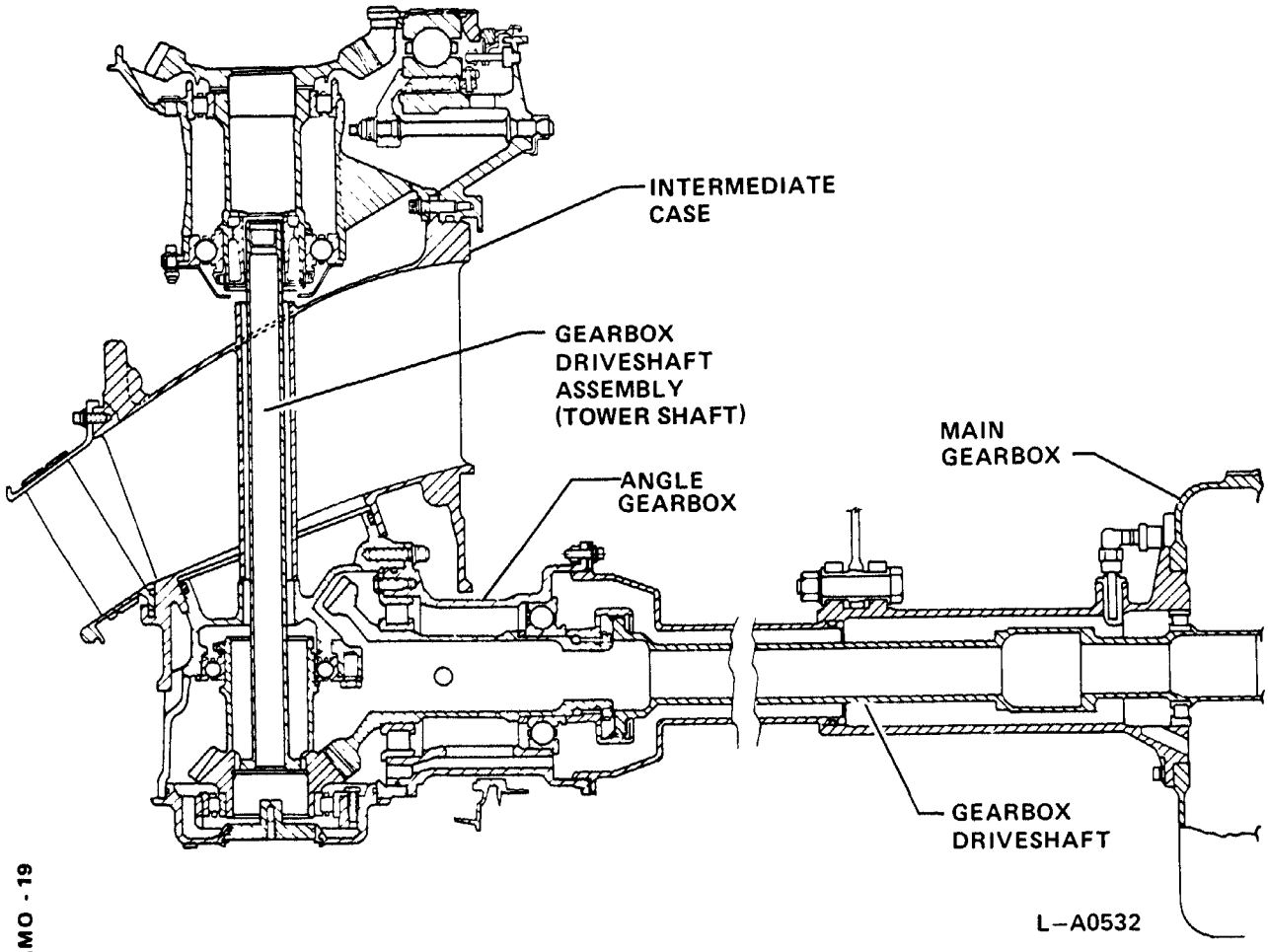
A



Intermediate Case
Figure 001

TOWER SHAFT - DESCRIPTION AND OPERATION

1. Description (Ref. Fig. 001)
   The towershaft drives the angle gearbox bevel gear set which transmits power to the main gearbox group through the gearbox driveshaft assembly. The angle gearbox is located in the intermediate case group completely enclosed between the fan exit case rear and the intermediate case OD wall.



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Main and Angle Gearbox
Figure 001

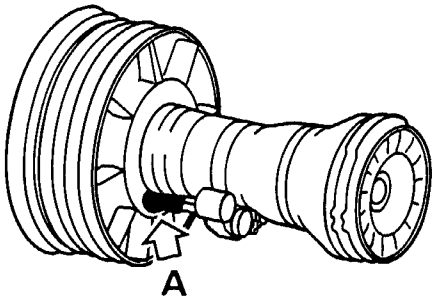
ANGLE GEARBOX ASSEMBLY - DESCRIPTION AND OPERATION

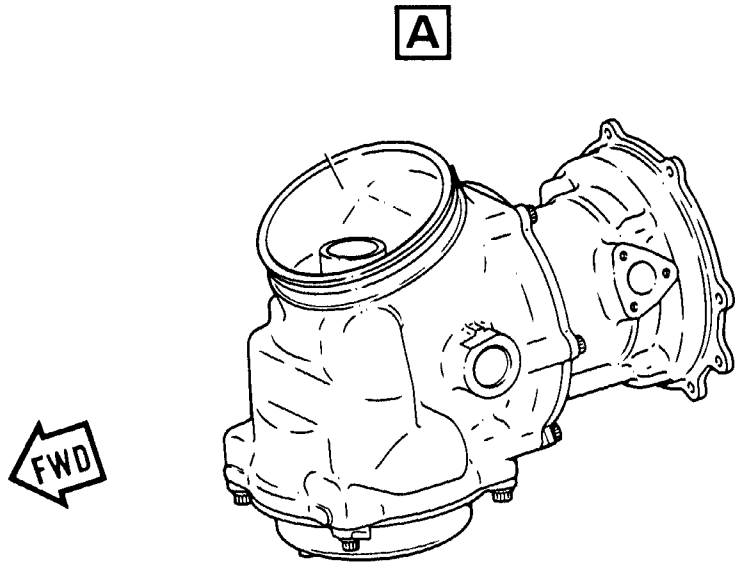
1. Description (Ref. Fig. 001)

A. The angle gearbox transmits the power from the engine rotor to the main gearbox and from the starter on the main gearbox to the engine rotor. The angle gearbox housing is a cast aluminum housing that contains a bevel gear set that transmits the power from the towershaft to the layshaft. The general lubrication of the gears and bearings is accomplished by oil splash and by pressure oil supplied through three jets directed at the bearings and splines.

B. The angle gearbox is located between the intermediate case OD wall and the fan exit guide vane ID attachment at the bottom of the intermediate case.

C. The angle gearbox oil scavenge pump is located in the main oil/scavenge pump module mounted at the bottom rear of the main gearbox housing.





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L—A0531

Angle Gearbox
Figure 001

ANGLE GEARBOX ASSEMBLY - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A. PWA85518	Puller
B. PWA85768	Puller
C. PWA87502	Puller, Knocker (Optional to PWA 101035)
D. PWA87514	Gage, Plug
E. PWA87552	Crimper
F. PWA87553	Crimper
G. PWA101035	Puller, Jackscrew
H. PWA102830	Adapter
I.	Circuit Breaker Safety Clips
J.	Corrosion Resistant Steel Lockwire (AS3214-02)(Ref. 70-00-00)
K.	Torque Wrench
L.	Container Suitable for Oil 5 Gallons (19L)
M.	Key
N.	Key Washer
P.	Packings
Q. Material No.P03-001	Oils (Ref. 70-00-00)
R. Material No.P03-006	Oils (Ref. 70-00-00
S. Material No.P05-038	Special Materials (Ref. 70-00-00)
T. Material No.P05-289	Special Materials (Ref. 70-00-00)
U. Material No.P05-291	Special Materials (Ref. 70-00-00)
V. Material No.P05-292	Special Materials (Ref. 70-00-00)
R W. Material No.P06-054	Lubricants (Ref. 70-00-00)
X. Material No.P09-027	Sealants (Ref. 70-00-00)
Y. Material No.P11-014	Cleaning Agents (Ref. 70-00-00)
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 72-00-00, P. Block 601	Engine - General
- 72-23-05, P. Block 401	Fan Exit Liner Segment

2. Procedure

A. Job Set-Up

(1)Open, safety and tag the circuit breakers for the appropriate engine. Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Removal (Ref. Fig. 401)

(1)Put a 5 U.S. gallon (18.9 l) container under the tube connections to collect oil (Ref. Fig. 401).

(2)Disconnect the angle-gearbox-oil-pressure-tube-assembly (LP09) as follows :

(a)Remove the lockwire or safety cable. Disconnect the tube nut from the adapter on the right side of the angle gearbox.

(b)Remove the bolts, nuts, and clamps that attach the tube to the HPC

brackets.
(c)Move the tube sufficiently to permit removal of the angle gearbox.
(3)Remove the angle-gearbox-oil-scavenge-tube-assembly (LR01) as follows :
(a)Remove the bolts that attach the tube to the rear of the angle gearbox.
(b)Remove the bolts that attach the tube to the right side of the oil pump.
(c)Remove the bolts, nuts, and clamps that attach the tube to the gearbox brackets. Remove the tube.
(d)Discard the packings.
(e)Install protective covers.
(4)For engines with the bracket attached to the top left side of the angle gearbox (Post SB PW4 ENG 75-45), remove the clamps, bolts and nuts that attach the (bottom) hydraulic manifold (CP02) and the (bottom) oil cooler inlet return manifold (CR04) to the bracket.

(5)Disconnect the gearbox driveshaft and the front housing from the angle gearbox, as follows (Ref. Fig. 402).
(a)Put a 5 U.S. gallon (18.9 l) container under the mating faces of the front housing and angle gearbox. Use it to collect oil.
(b)Remove the bolts that connect the brackets on the front housing to the HPC.
(c)Remove the bolts, washers, and nuts that attach the front housing and brackets to the angle gearbox.
(d)Loosen the clamp bolt that attaches the main-bearing oil-scavenge tube assembly (LR03) to the left bracket. Move the bracket out of the way.
(e)Use PWA102830 adapter to break loose the front and rear packings on the front housing.
(f)Move the front housing to the rear.
(g)Discard the packing on the front housing.
(h)Remove the retaining ring that attaches the gearbox driveshaft to the angle gearbox.
(i)Move the gearbox driveshaft to the rear.
(6)Remove intermediate case parts as follows (Ref. Fig. 403).
(a)Remove the fan exit liner segment (inner rear) that is at 6 o'clock (Ref. 72-23-05, P. Block 401).
(b)Remove the fan exit case flange assembly as follows.
1 Cut the sealant that is at the ends of the fan exit case flange assembly.
2 Bend the key at each end of the flange assembly. Remove and discard the keys.
3 Remove the fan exit case flange assembly.
(7)Remove the angle gearbox as follows :
(a)Put a 5 U.S. gallon (18.9 l) container under the angle gearbox to collect oil.
(b)Remove the plug from the side of the angle gearbox cover assembly as follows (Ref. Fig. 404).
1 Remove the bolt, washers, and plug.
2 Discard the packing.
(c)Remove the gearbox driveshaft assembly as follows (Ref. Fig. 405).
1 Remove the retaining ring that keeps the plug (gearbox cover) in the bottom of the angle gearbox.

2 With PWA 85518 Puller, remove the plug (gearbox cover). Discard the packing.
3 Remove the retaining ring that is inside the angle gearbox. It keeps the gearbox driveshaft assembly in place.
4 Remove the gearbox driveshaft assembly.

(d)Remove the angle gearbox with the PWA 101035 Jackscrew Puller as follows (Ref. Fig. 406) :

1 Remove the bolt and pin stop from each support bracket. Discard the pin stops.
2 Remove the two arms of the PWA 101035 Jackscrew Puller from the puller detail bar and attach the two arm assemblies into the angle gearbox brackets on the opposite sides of the angle gearbox with the two detail bolts hand tightened.
3 Remove the large jackscrew nut and washer which attach the puller detail bar to the main body bracket of the Jackshaft Puller.
4 Put the main body bracket of the PWA 101035 Jackscrew Puller between the 5th and 6th stage strut of the intermediate case and attach the main body bracket of the puller to the inner strut flanges with the four detail hex head cap screws hand tight only.
5 Attach the two detail arm assemblies of the jackscrew puller to the outer position of the puller detail bar and hand tighten the two detail bolts to lock the arms in place on the puller detail bar.
6 With PWA 101035 Jackscrew Puller assembly firmly in place, tighten the two detail bolts which attach the two arm assemblies to the two support brackets. Next, tighten the two bolts which attach the arm assemblies to the outer position of the puller detail bar. Next, tighten the four detail hex head cap screws which attach the puller main body bracket to the inner strut flanges. Next, install the washer and large detail jackscrew nut to the puller detail bar and hand tighten.
7 (Pre SB PW4ENG 72-438) Remove the lockwire and bolts that attach the two support brackets to the intermediate case.
8 (Post SB PW4ENG 72-438) Unbend the tabs of the key washers. Remove the bolts that attach the two support brackets to the intermediate case. Remove and discard the key washers.
9 Turn the large detail jackscrew nut to disengage the angle gearbox from the intermediate case. Remove the gearbox with the puller from the intermediate case.
10 Lower the angle gearbox. Install it in a stand.
11 Remove the four detail screws that attach the puller to the two strut flanges.
12 Discard the packing that is on the upper OD of the angle gearbox.
13 If necessary, remove the support bracket at each side of the angle gearbox.
14 Install protective covers.

(e)Remove the angle gearbox with the PWA 87502 Knocker Puller (Optional to PWA 101035 Jackscrew Puller) as follows (Ref. Fig. 407) :

1 Remove the bolt and pin stop from each support bracket. Discard the pin stops.
2 Put the jaws of the PWA 87502 Knocker Puller on the brackets on opposite sides of the angle gearbox.

3 Attach the jaws to the angle gearbox support brackets with the detail bolts. Tighten the two detail bolts.
4 (Pre SB PW4ENG 72-438) Remove the lockwire or safety cable and bolts that attach the two support brackets to the intermediate case.
5 (Post SB PW4ENG 72-438) Unbend the tabs of the key washers. Remove the bolts that attach the two support brackets to the intermediate case. Remove and discard the key washers.
6 Quickly pull the slide hammer against the handle many times until you loosen the angle gearbox from the engine. Remove the gearbox with the puller from the intermediate case.
7 Remove the two detail bolts that attach the puller jaws to the two strut flanges. Remove the puller from the angle gearbox.
8 Put the angle gearbox in a stand.
9 Discard the packing that is on the upper OD of the angle gearbox.
10 If necessary, remove the support bracket at each side of the angle gearbox.
11 Install protective covers.

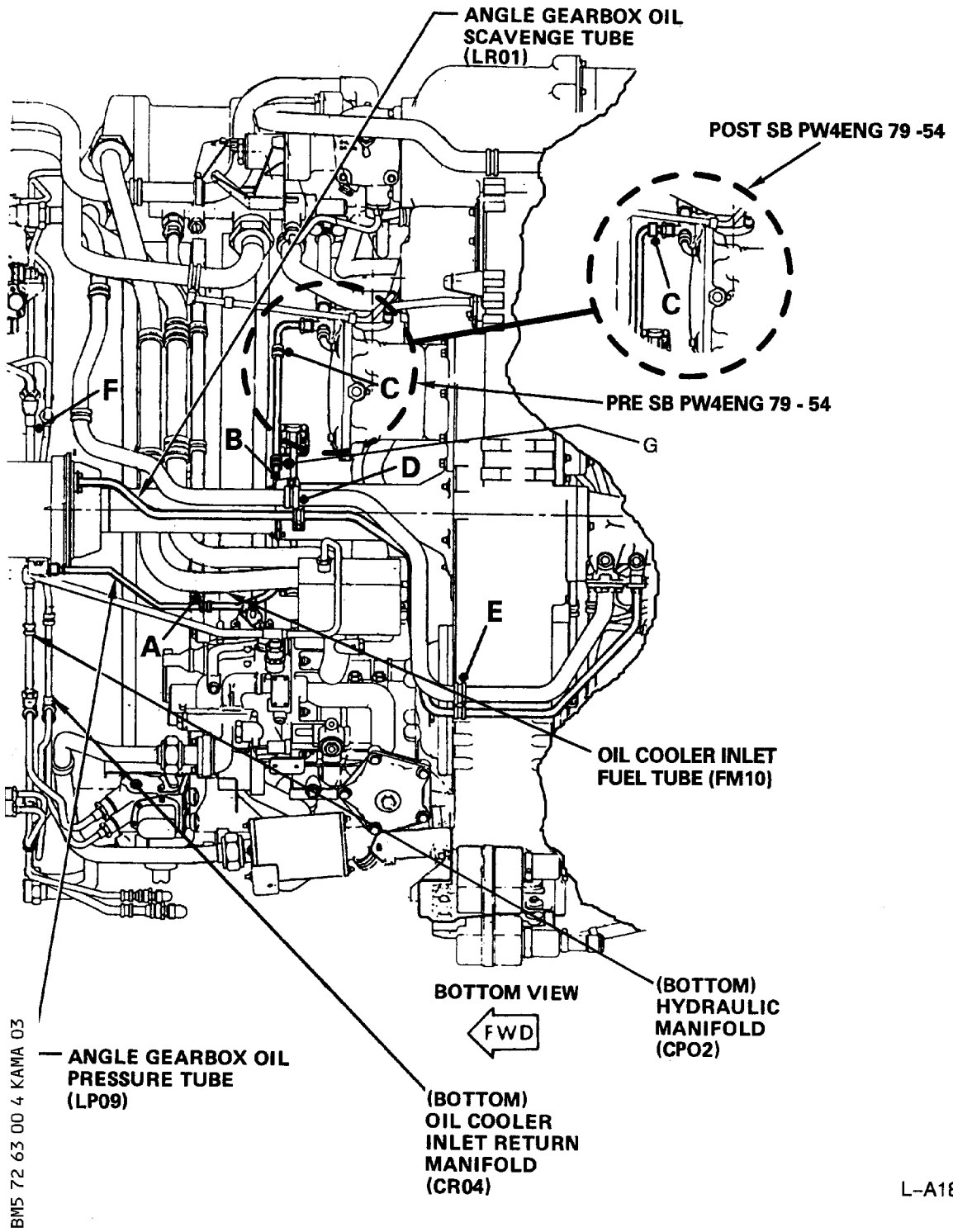
(8) Remove the gearbox driveshaft and front housing from the main gearbox as follows (Ref. Fig. 402).
(a) Pull the gearbox driveshaft and the front housing out of the gearbox driveshaft housing assembly (called rear housing).
(b) Discard the packing that is on the rear of the front housing.

C. Installation

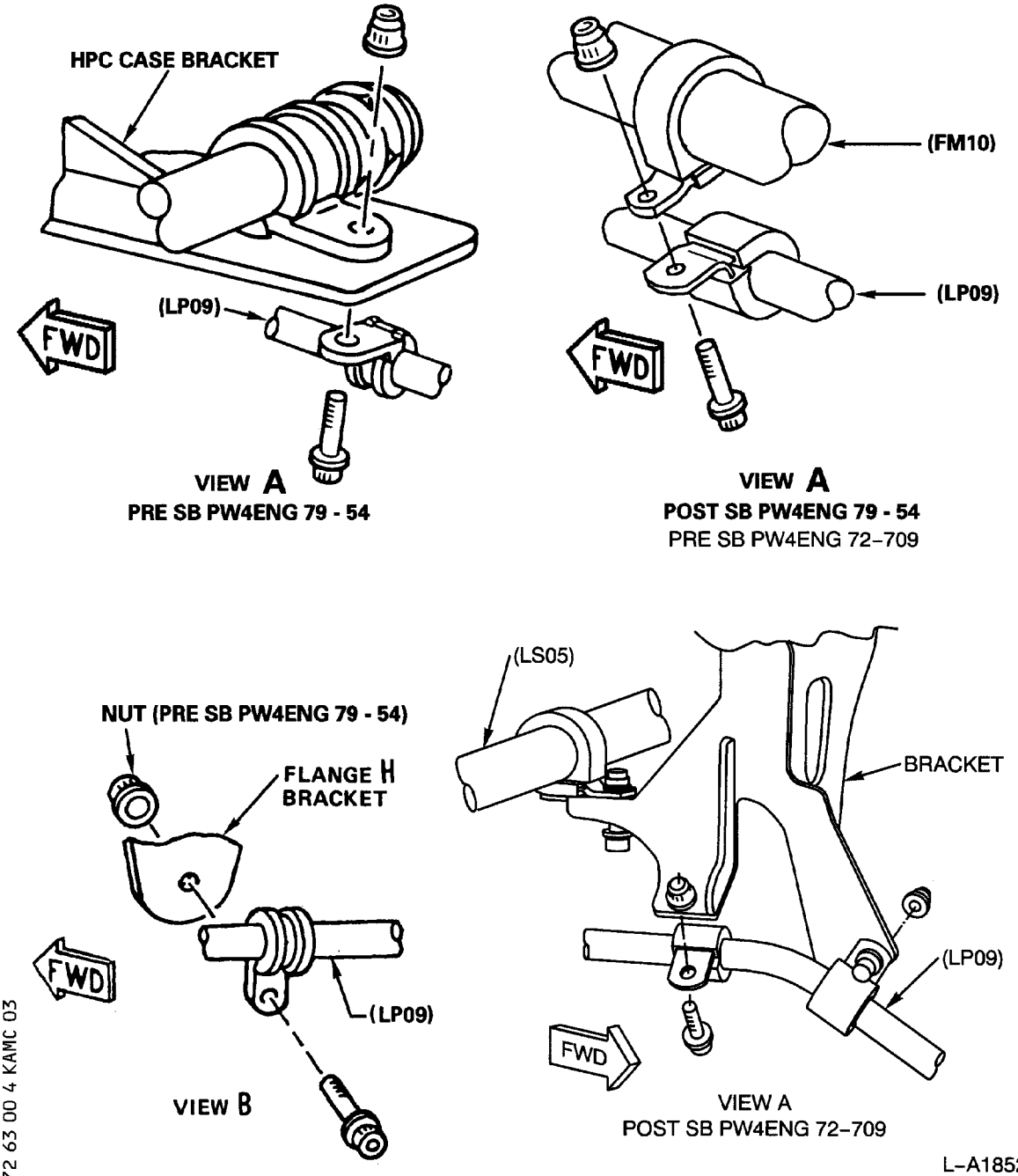
NOTE : (Ref. 72-00-00, P. Block 601) for interface fits and clearances. Special torques and special assembly procedures appear where necessary in the following text and are identified by a reference number.

(1) Install the gearbox driveshaft and gearbox driveshaft (front) housing assembly (called front housing) in the gearbox driveshaft housing assembly (called rear housing) (Ref. Fig. 402).
(a) Install the gearbox driveshaft and retaining ring in the front housing.
(b) Lubricate with Engine Oil (P03-001) a new packing. Install the packing in the rear groove of the front housing.
(c) Install the front housing in the rear housing. Move the front housing to the rear.
(d) Engage the splines of the gearbox driveshaft with the splines in the main gearbox. Move the gearbox driveshaft to the rear.

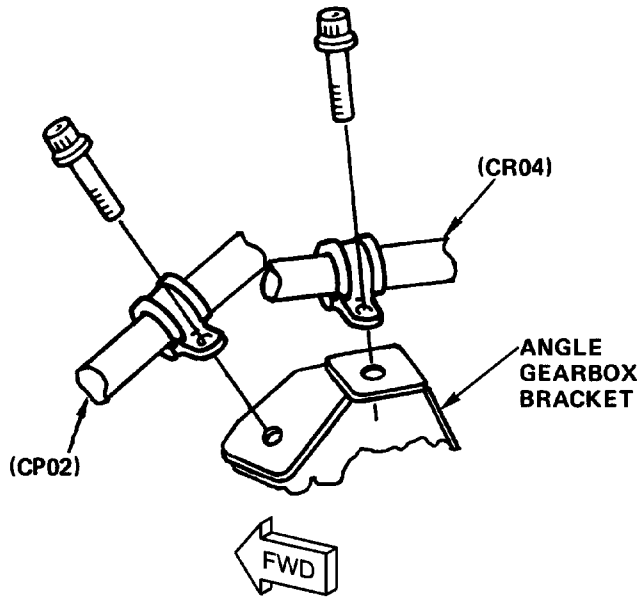
(2) Install the angle gearbox (Ref. Fig. 404).
(a) Intall the plug in the side of the angle gearbox cover assembly.
1 Lubricate with Material No.P03-001 one packing. Install it on the plug.
R 2 Lubricate with Material No.P06-054 the threads of two bolts.
3 Attach the plug to the angle gearbox cover assembly with two washers and the two bolts. TORQUE the bolts to between 62 and 72 lbf.in. (0.70 and 0.81 m.daN).
(b) Install the angle gearbox in the intermediate case. (Ref. Fig. 407)
1 If not installed, install a support bracket on the hollow pin at each side of the angle gearbox.
2 Apply Material P03-001 to the threads of two bolts. Attach a pin stop



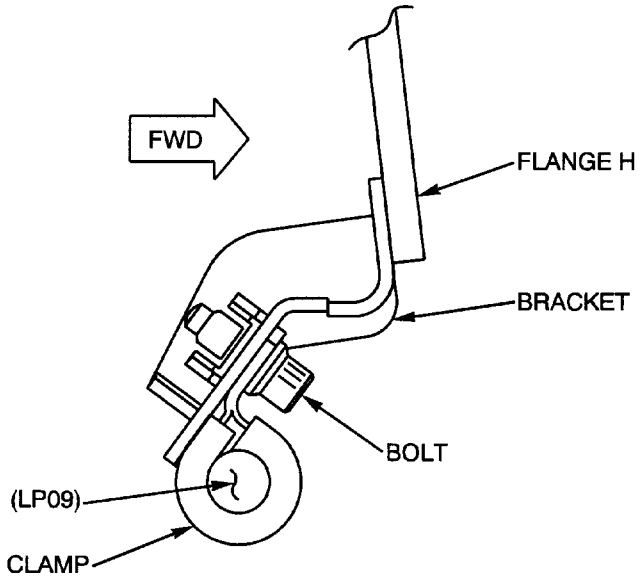
Tubes (Sheet 1/3)
Figure 401



Tubes (Sheet 2/3)
Figure 401



(POST SB PW4ENG 75-45 ONLY)
VIEW F

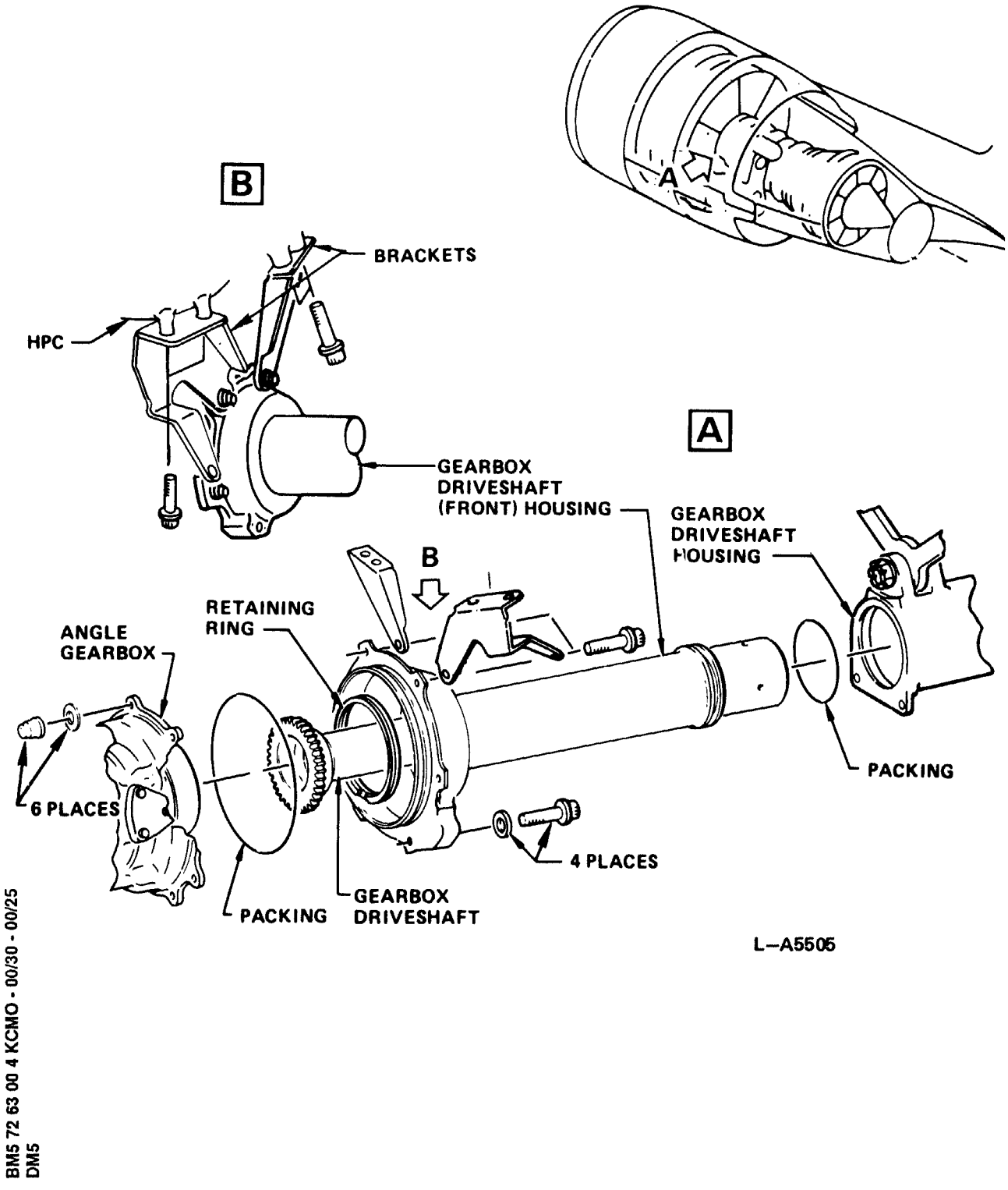


VIEW G
POST SB PW4ENG 72-709

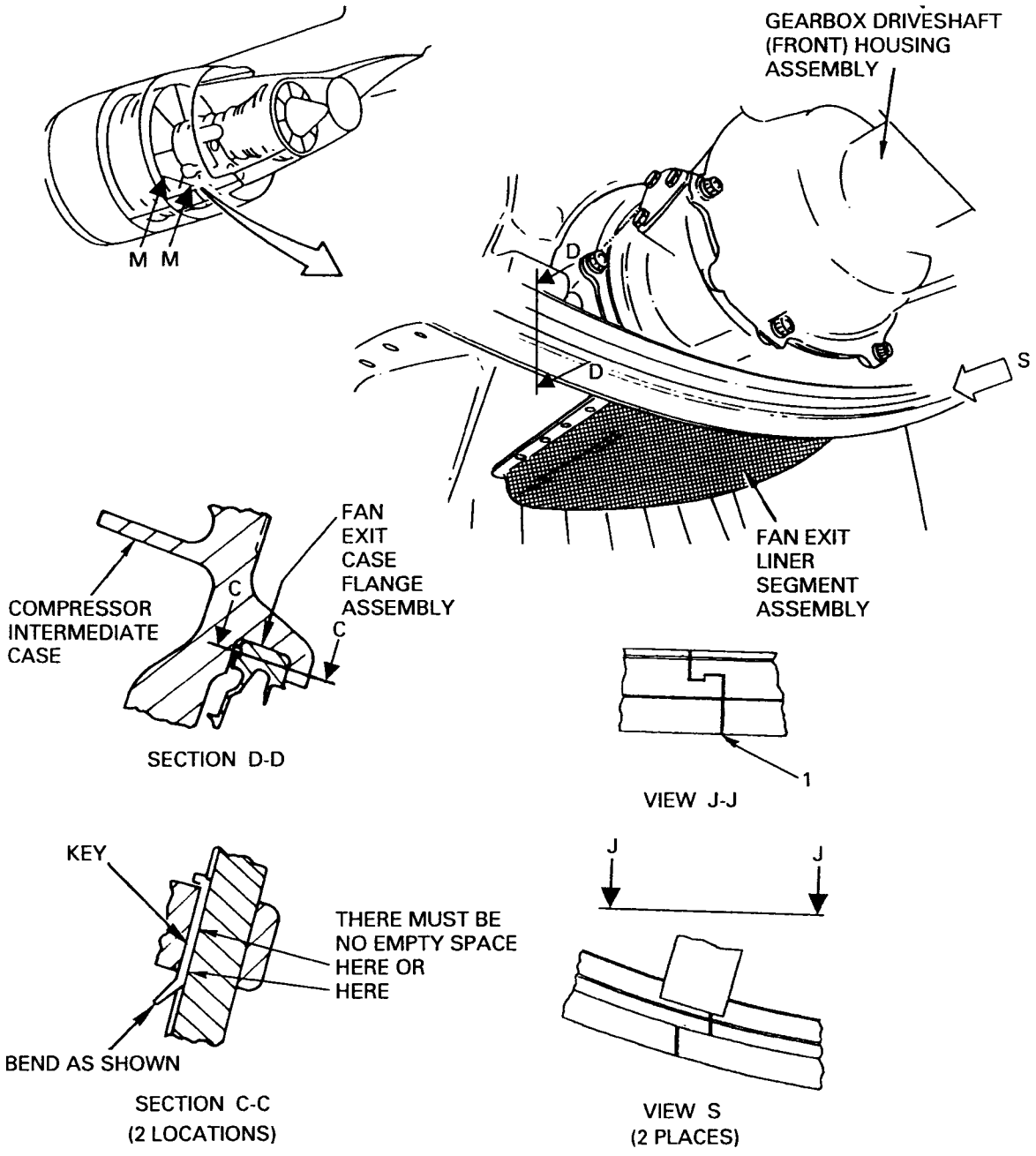
L-A6475 (1200)

BM5 72 63 00 4 KAME 02

Tubes (Sheet 3/3)
Figure 401



Gearbox Driveshaft and Front Housing
Figure 402

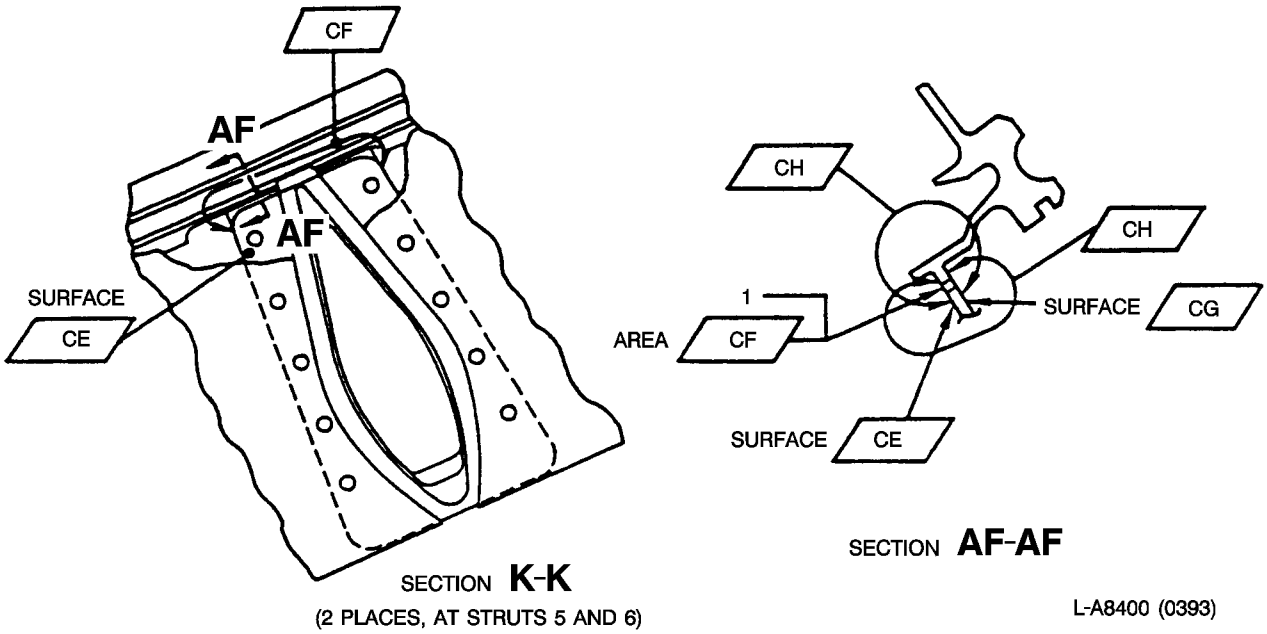


L-A5424 (0593)

BM5 72 63 00 4 KEMA 01

1. APPLY SEALANT TO THE ENDS OF THE FLANGE ASSEMBLY, TWO LOCATIONS FILL THE JOINT FLUSH TO 0.010 inch (0 254 mm) ABOVE ALL SURFACES .

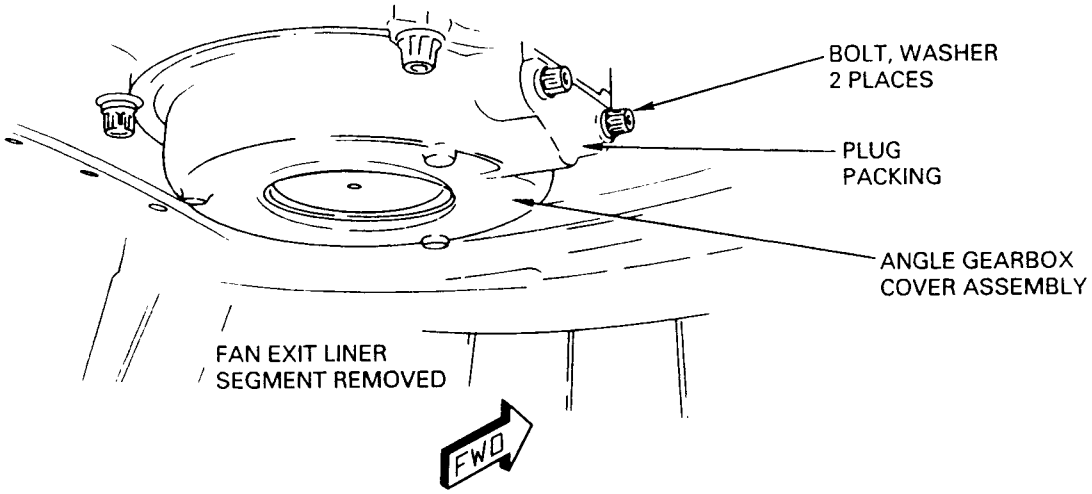
Intermediate Case Parts (Sheet 1/2)
Figure 403



1 . AFTER YOU CLEAN AREA CH, FULLY FILL AREA CF. THE SEALANT MUST BE FLUSH WITH, OR UP TO 0.020 in. (0.508 mm) BELLOW, SURFACE CE. IT IS PERMITTED FOR THE SEALANT TO BE ABOVE SURFACE CG. THE HEIGHT IS NOT IMPORTANT.

BM5 72 63 00 4 KEMC 01

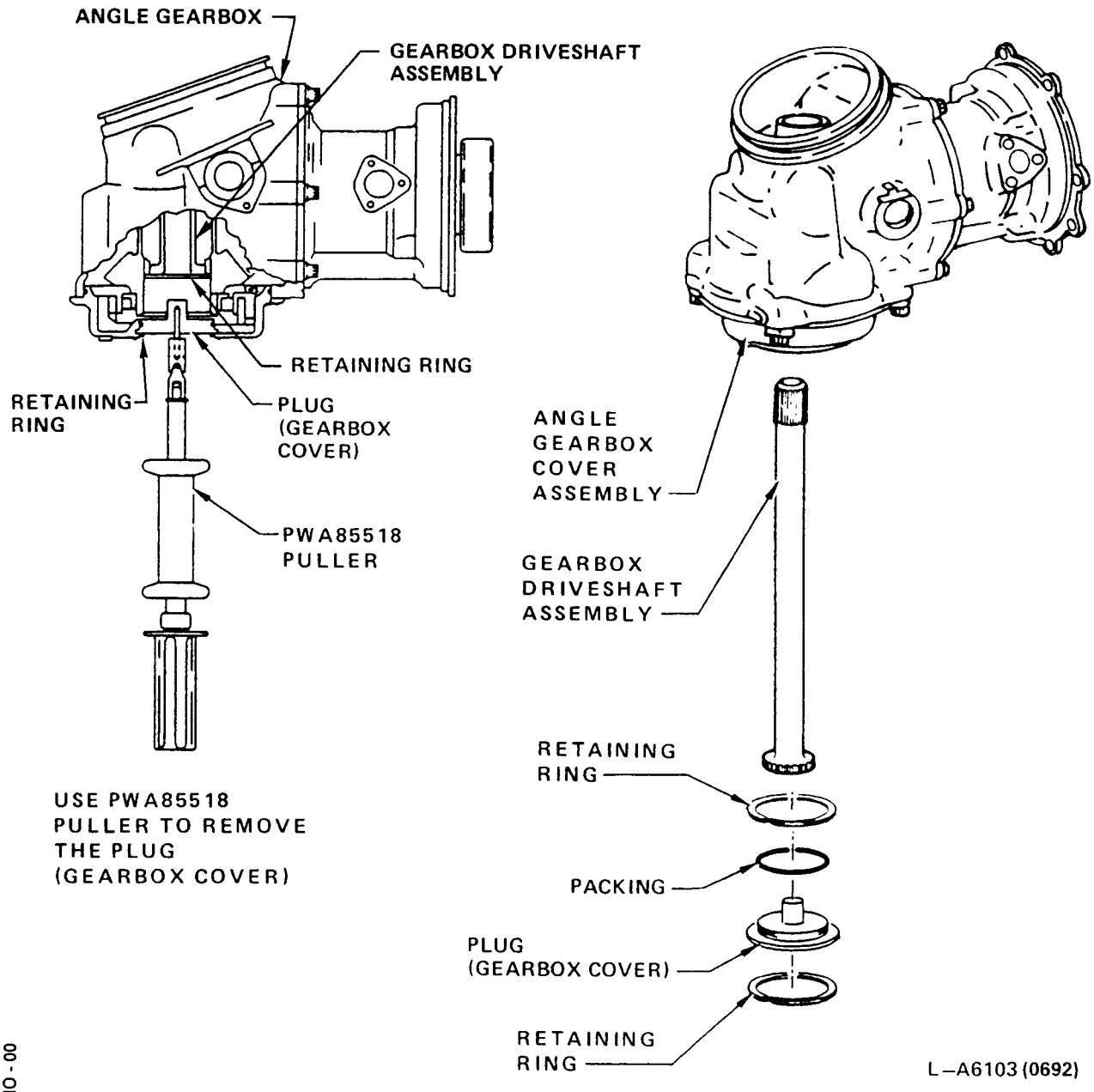
Intermediate Case Parts (Sheet 2/2)
Figure 403



BM5 72 63 00 4 KGMO - 01

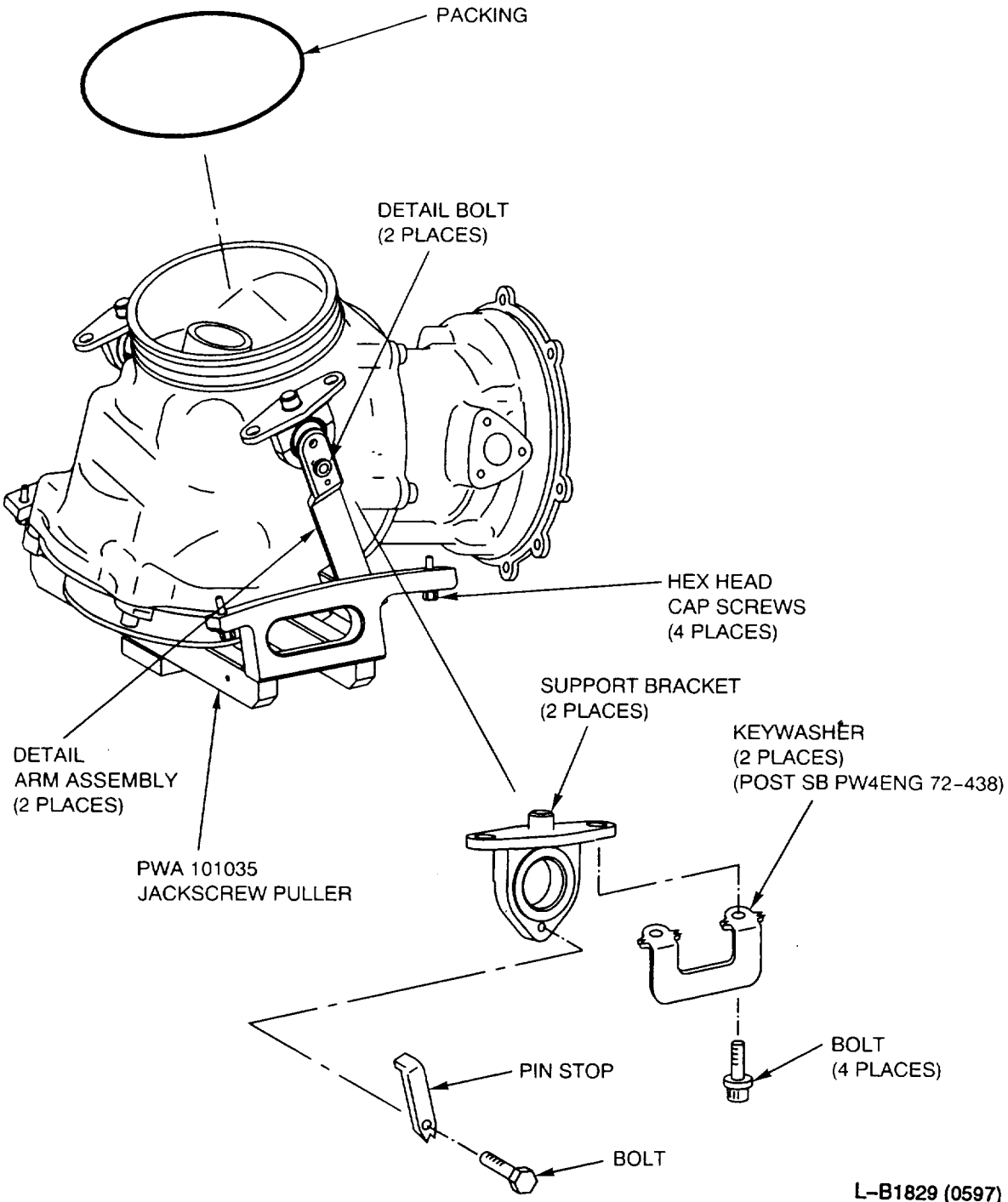
L-A5425 (0692)

Plug on the Side of the Angle Gearbox Cover Assembly
Figure 404



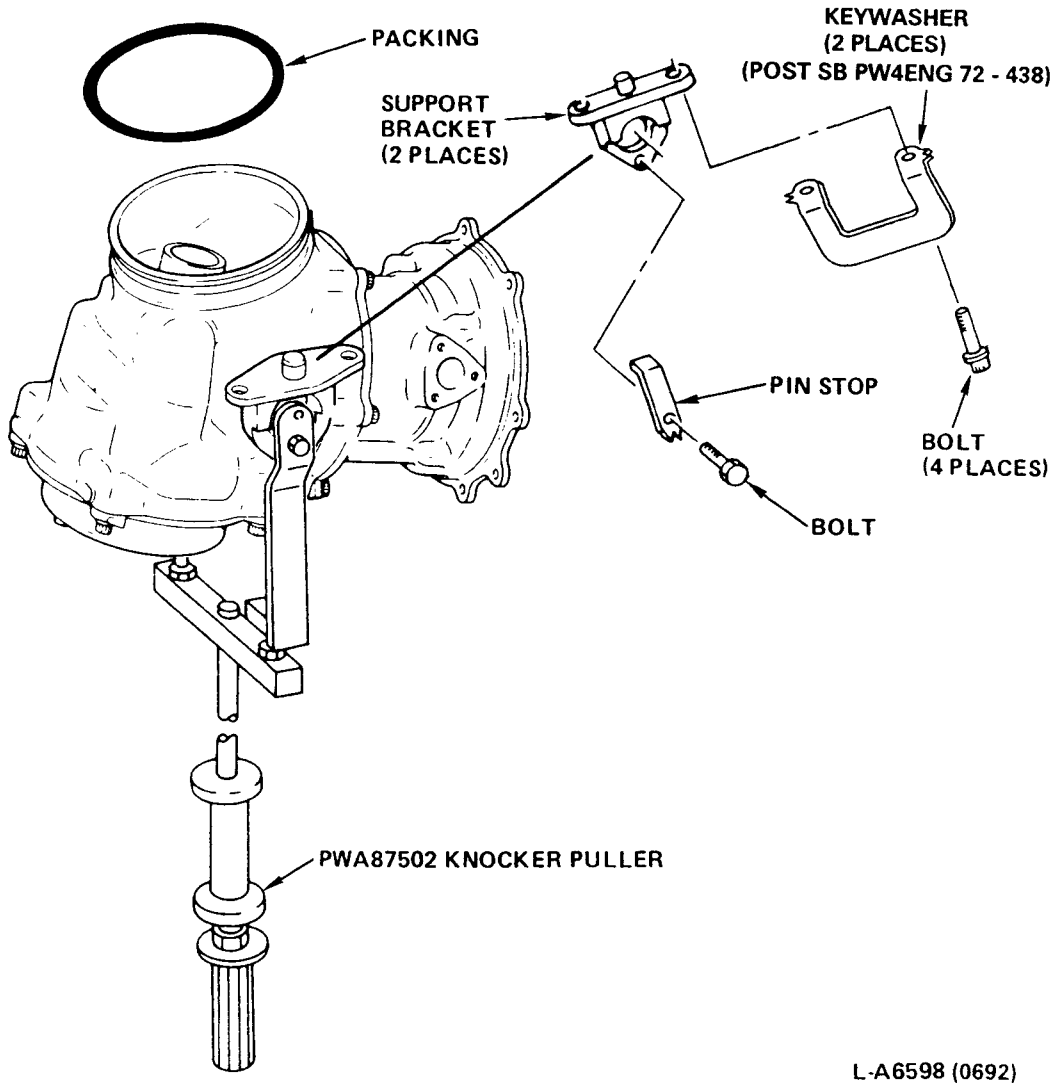
BM5 72 63 00 4 KHMO - 00

Removal of the Gearbox Driveshaft Assembly
Figure 405



BM5 72 63 00 4 KPM0 01

Removal of the Angle Gearbox with PWA 101035 Jackscrew Puller
Figure 406



BM5 72 63 00 4 KNMO - 01

Removal of the Angle Gearbox with PWA 87502
Knocker Puller
Figure 407

to each support bracket with the bolts. Twist the free end of each stop counterclockwise until it touches the ID of the pin. While you hold the stops, TORQUE the bolts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN). Bend the keys on the stops.

3 Lubricate with Engine Oil (P03-001) one packing. Install it on the upper OD of the angle gearbox.

4 Put the angle gearbox in the correct position in the intermediate case.

5 Apply Material No.P03-001 to the threads of four bolts.

6 (Pre SB PW4ENG 72-438) Attach the angle gearbox to the intermediate case with the four bolts.
TORQUE the bolts to between 225 and 300 lbf.in. (2.55 and 3.38 m.daN) and install lockwire (Material No.P05-289) or safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292).

7 (Post SB PW4ENG 72-438) Put the two keywashers in the correct position against the support brackets. Attach the angle gearbox with the bolts through the keywashers and support brackets. TORQUE the bolts to between 275 and 300 lbf.in. (3.11 and 3.38 m.daN). Bend the tabs of the keywashers against the bolts. Use PWA 87553 Crimper. Then use PWA 87552 Crimper.

(c)Install the gearbox driveshaft assembly (Ref. Fig. 408).

1 Lubricate with Engine Oil (P03-001) the splines of the gearbox driveshaft assembly.

2 Put the gearbox driveshaft assembly in position in the angle gearbox, mating splines.

3 Install the retaining ring to keep the gearbox driveshaft assembly in position.

(d)Do a check of the installation of the gearbox driveshaft retaining ring.

1 Install PWA 87514 Gage in the bore of the bevel gear.

2 If the retaining ring is correctly installed, the detail stop bar will touch the bottom of the bevel gear.

(e)Install the plug (gearbox cover) (Ref. Fig. 404).

1 Lubricate with Engine Oil (P03-001) one packing.

2 Install the packing on the plug (gearbox cover).

3 Install the plug (gearbox cover) in the angle gearbox cover assembly.

4 Install the retaining ring in the angle gearbox cover assembly.

(3)Install the intermediate case parts as follows (Ref. Fig. 403).

(a)Mechanically remove any sealant that is at the ends of the flange assembly and at the trailing edges of the platforms of struts five and six.

(b)Install the fan exit case flange assembly as follows.

1 Install the fan exit case flange assembly.

2 Install a key at each end of the fan exit case flange assembly in the lugs of the struts of the intermediate case.
Use the correct class of key (Ref. Fig. 403).

3 Bend the keys as shown in the figure.

(c)Apply sealant to the ends of the fan-exit-case-flange-assembly and the trailing edges of the platforms of struts five and six as follows.

1 Clean the area where you will put the sealant.
Use a piece of Material No.P05-038 that is moist with Material

No.P11-014.

2 Dry the surfaces fully in air that is at room temperature. There must be no solvent on the surfaces when you apply the sealant.

3 Apply Material No.P09-014 or Material No.P09-027 where shown. Cure the sealant in air that is at room temperature and has a relative humidity of 25 percent, minimum.

4 Cure the sealant at the ends of the flange assembly for eight hours before engine operation.

5 Cure the sealant at the struts for two hours, minimum and until no longer tacky, before engine operation.

(d) Install the fan exit liner segment (inner rear) that you removed (Ref. 72-23-05, P. Block 401).

(4) Connect the gearbox driveshaft and front housing to the angle gearbox (Ref. Fig. 402).

(a) Move the gearbox driveshaft forward. Engage the mating splines of the gearbox driveshaft and angle gearbox.

(b) If the splines do not engage, you must turn the gearshaft in the main gearbox (Ref. Fig. 409).

CAUTION : DO NOT REMOVE THE (SCAVENGE PUMP DRIVE) BEARING HOUSING ASSEMBLY.

1 Remove the two bolts and washers that attach the cover (manual crank) to the main gerabox.

2 Remove the cover (manual crank) with PWA 85768 Puller. Discard the packing.

3 With a standard wrench, turn the gearshaft that is inside.

4 Engage the mating splines of the gearbox driveshaft and the angle gearbox.

5 Install the retaining ring in the angle gearbox to keep the gearbox driveshaft in position.

6 Lubricate with Engine Oil (P03-001) a new packing. Install it on the cover (manual crank).

R 7 Lubricate with Antiseize Compound (P06-054) two bolts. Attach the cover (manual crank) to the main gearbox with two washers and the two bolts. TORQUE the bolts to between 62 and 72 lbf.in. (0.70 and 0.81 m.daN).

(c) Install the retaining ring in the angle gearbox to keep the gearbox driveshaft in position (Ref. Fig. 402).

(d) Lubricate with Engine Oil (P03-001) a packing. Install the packing in the front groove of the front housing.

R (e) Lubricate with Antiseize Compound (P06-054) the threads of six nuts.

(f) Attach the front housing and two brackets to the angle gearbox with two bolts, two washers, and two of the nuts. Tighten the bolts.

(g) Attach the front housing to the angle gearbox at the other locations with four bolts, eight washers, and four of the nuts. Tighten the bolts.

(h) Attach the brackets on the front housing to the HPC as follows :

1 Lubricate with Engine Oil (P03-001) the threads of four bolts.

2 Attach the brackets to the HPC with the four bolts. Tighten the bolts. TORQUE the bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(i) TORQUE the bolts in the front housing to between 62 and 72 lbf.in.

(0.70 and 0.81 m.daN).

(j)Tighten the clamp bolt that attaches the main-bearing oil-scavenge tube assembly (LR03) to the left bracket. TORQUE the clamp bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(5)Connect the angle-gearbox-oil-pressure-tube-assembly (LP09) as follows. (Ref. Fig. 401)

(a)Remove the protective covers.

R (b)Apply Antiseize Compound (P06-054) to the threads of the tube nut.

(c)Install the tube nut on the adapter that is on the right side of the angle gearbox. Tighten it with your hand.

(d)Apply Engine Oil (P03-001) to the threads of the clamp bolts. Attach the tube clamps to the HPC brackets with the bolts and nuts.

(e)TORQUE all clamp bolts to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).

(f)TORQUE the tube nut to between 200 and 225 lbf.in. (2.26 and 2.54 m.daN) and install lockwire (Material No.P05-289) or safety cable (Material No.P05-291) and safety cable ferrule (Material No.P05-292).

(6)Connect the angle-gearbox-oil-scavenge-tube-assembly (LR01) as follows.

(a)Remove the protective covers.

(b)Apply Engine Oil (P03-001) to two packings. Install a packing at each end of the tube.

R (c)At the rear end, apply Antiseize Compound (P06-054) to the threads of two bolts. Attach the tube to the oil pump with the two bolts. Tighten the bolts with your hand.

(d)At the front end, apply Engine Oil (P03-001) to the threads of two bolts. Attach the tube to the front housing with the two bolts. Tighten the bolts with your hand.

(e)Apply Engine Oil (P03-001) to the threads of the clamp bolts. Attach the tube clamps to the brackets on the driveshaft housing and main gearbox with the bolts and nuts. TORQUE the bolts to between 36 and 40 lbf.in. (0.40 and 0.45 m.daN).

(f)TORQUE the bolts at the front end of the tube to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN). TORQUE the bolts at the rear end of the tube to between 62 and 72 lbf.in. (0.70 and 0.81m.daN).

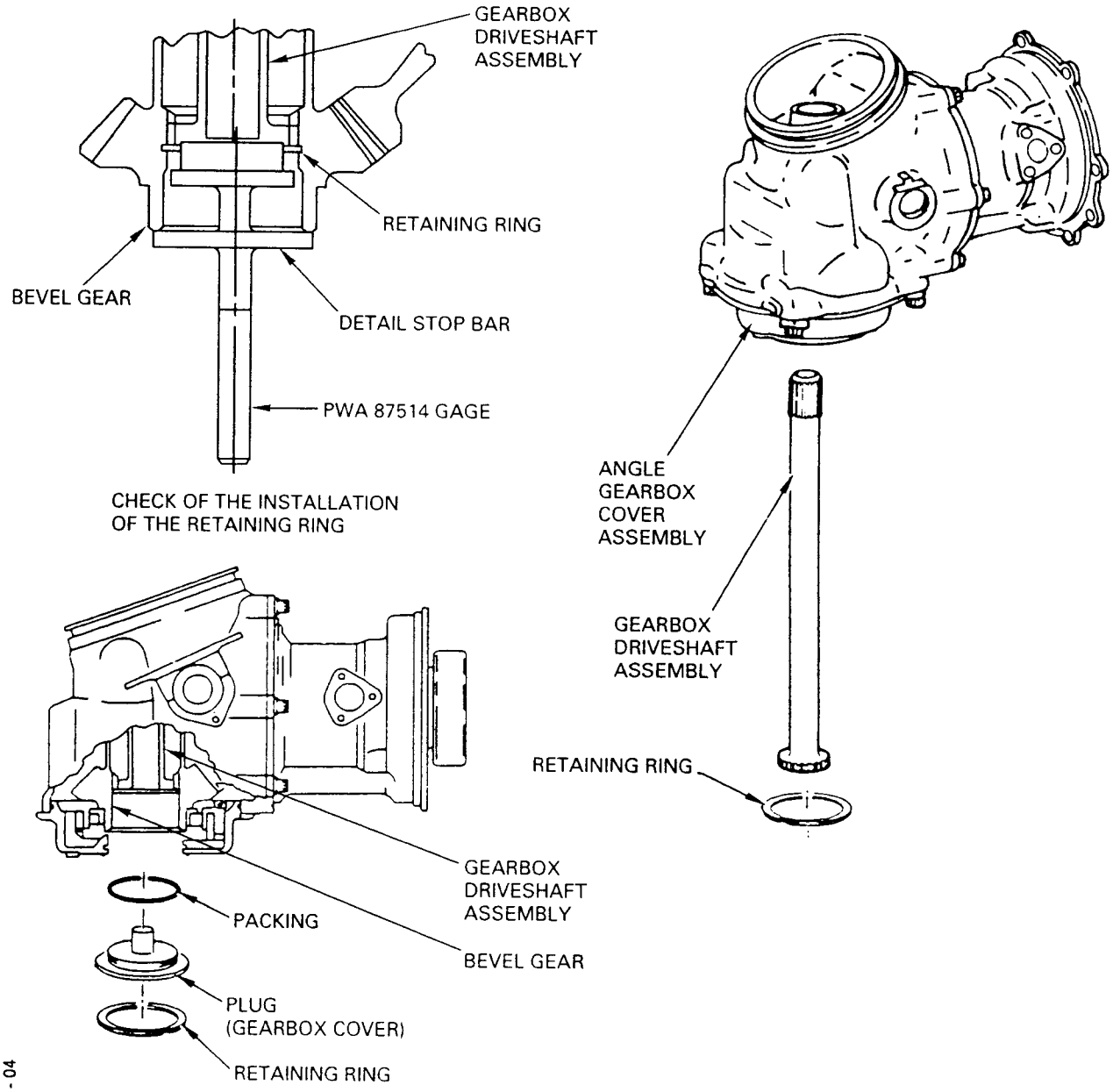
(7)For engines with the bracket attached to the top left side of the angle gearbox (Post SB PW4 ENG 75-45), install the clamps, bolts, lubricated with Engine Oil (P03-001), and nuts that attach the (bottom) hydraulic pressure manifold (CP02) and the (bottom) oil cooler inlet return manifold (CR04).
TORQUE the clamp bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

D. Close-Up

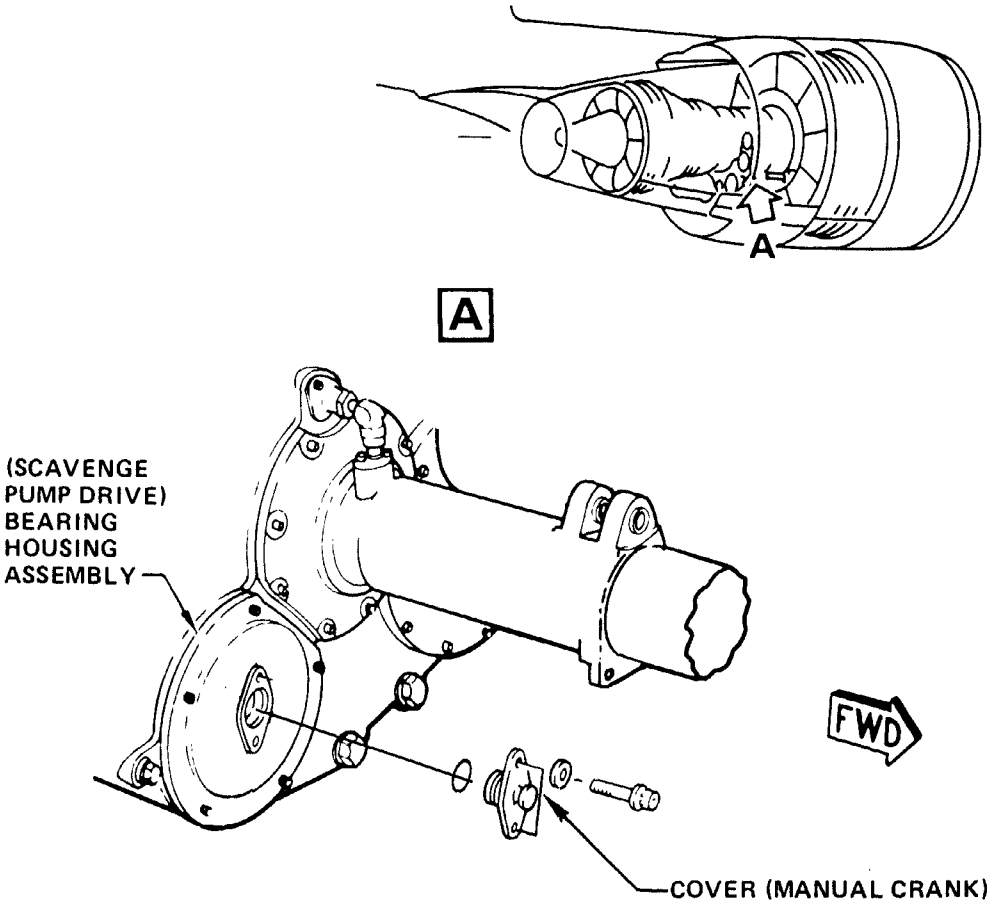
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.

(2)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. block 301). Remove safety clips and tags and close circuit breakers for the appropriate engine.

(3)Test engine using the Test Reference Table (Ref. 71-00-00, P. Block 501).



Installation of the Gearbox Driveshaft Assembly
Figure 408



MAIN GEARBOX

L–A5423

BM5 72 63 00 4 KLMO - 00/30 - 00/25
DM5

Cover (Manual Crank)
Figure 409

R

1. Examine the Angle Gearbox for Cracks, Oil Leaks, and Corrosion
(Ref. Table 601)

A. Equipment and Materials

ITEM	DESIGNATION
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

B. Job Set-up
(1)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Inspection

EXAMINE	PERMITTED
All surfaces for :	
- Cracks	None
- Oil Leaks	None
Corrosion :	
- Depth	0.05 in. (1.270 mm) maximum
- Area	1 in² (645 mm2) maximum
- Separation from another area of corrosion	2 in. (50.8 mm) minimum

Table 601

D. Close-Up
(1)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

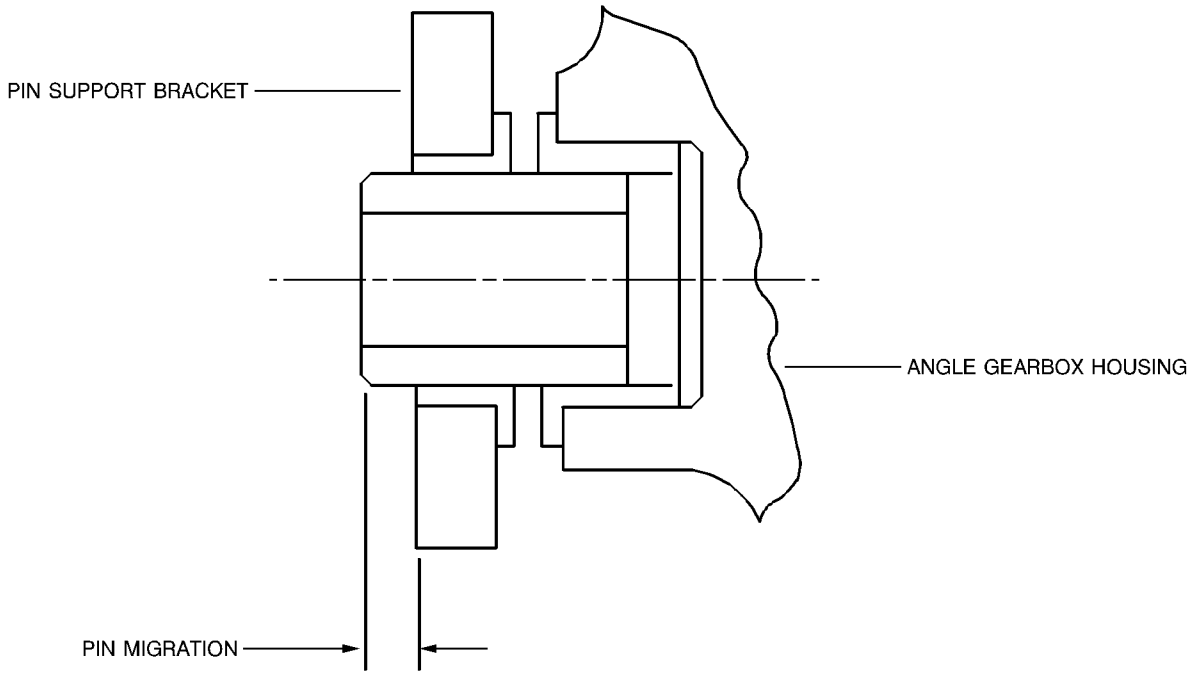
R 2. Examine the Angle Gearbox for Support Pin Migration

R A. Equipment and Materials

R ITEM	DESIGNATION
R None	

R B. Inspection
R (1)Visually inspect for pin migration beyond the support bracket on both
R sides of the Angle Gearbox (Ref. Fig. 601).
R (2)Pin migration that is greater than 0.125 in. (3.175 mm) is to be

R inspected every 25 cycles.
R (3)Maximum pin migration is 0.250 in. (6.350 mm). Remove Angle Gearbox from
R service.



BM5 72 63 00 6 KAM0 00

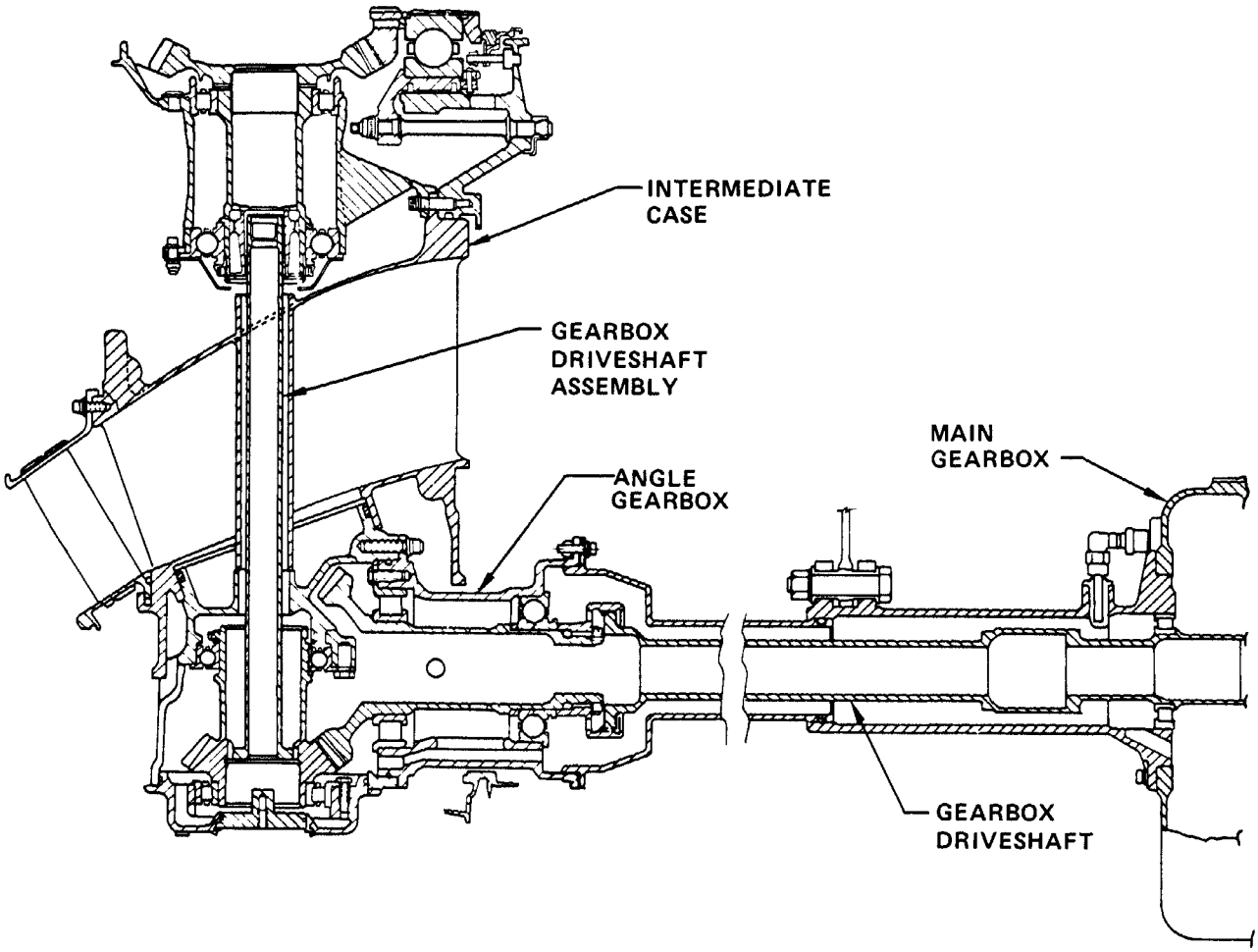
L-D3488 (0606)
PW V

Inspection of AGB Pin Migration
Figure 601

R

HORIZONTAL DRIVE SHAFT ASSEMBLY - DESCRIPTION AND OPERATION

1. Description (Ref. Fig. 001)
The horizontal drive shaft assembly is mounted between the angle and accessory gearboxes. The function of the drive shaft is to transmit torque from the angle gearbox to the accessory gearbox.



BM5 72 64 00 0 KAMO - 19

L-A0532

Gearbox Driveshaft
Figure 001

ACCESSORY GEARBOX ASSEMBLY - DESCRIPTION AND OPERATION

1. General Description (Ref. Fig. 001, 002, 003)
(Ref. Fig. 004)

Main gearbox power to drive the engine and aircraft supplied accessories is obtained from the High Pressure Compressor rotor (HPC). A towershaft in the intermediate case is geared to the front of the rotor.

The main gearbox group incorporates drive pads for the engine fuel pump and fuel metering unit (tandem mounted), engine hydraulic pump(s), the starter, the integrated drive generator system. Provisions are also incorporated to permit hand cranking of the high compressor rotor to allow more complete inspection through the borescope ports.

The gearbox engine accessories include an electronic engine control alternator, a lubrication and scavenge oil pump module and an oil filter housing.

The main gearbox transmits power from the engine to the accessories mounted on the gearbox. It provides specific speeds, torques and mounting provisions required for the accessories to perform their various functions.

The main gearbox is located at the bottom of the HPC rear case and immediately in front of the diffuser case.

It is attached utilizing a three point system. Two points of this system are widely spaced, transverse-pin supported ball joints between the gearbox and the engine case at Flange K. The third support point consists of a vertical link with a single ball joint attachment on the gearbox driveshaft housing and two ball joint attachments on the HPC rear case. The ball joint attachments are free to move upon their support pins to allow for engine diameter thermal growth without imposing loads on the gearbox mounting system.

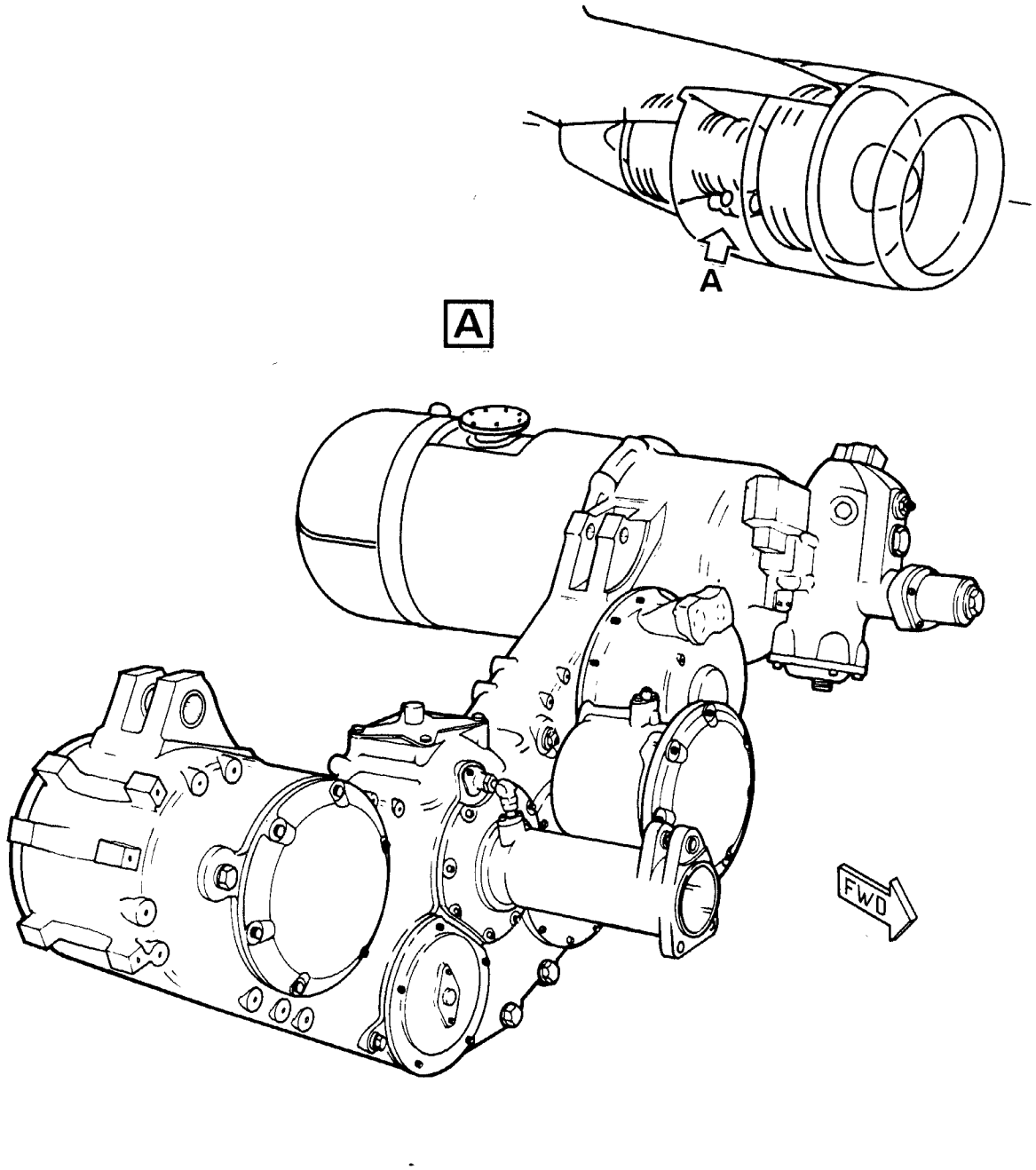
The main gearbox consists of a cast aluminum housing incorporating a gear train and mounting pads for airframe and engine accessories. Drive pads on the rear face of the housing are furnished for the integrated drive generator system, for the starter, for the engine hydraulic pump and for the main oil/scavenge pump. The electronic engine control generator drive pad and the breather pad are also on the rear face (Ref. Fig. 002). The front face of the housing has pads for mounting the fuel pump/fuel metering unit in tandem, and the hydraulic pump.

With the oil tank mounted directly into the gearbox housing from the rear, the main oil filter is installed on a pad on the front face.

The power to drive the accessories is obtained from the high pressure compressor. A towershaft in the intermediate case is geared to the front of the HPC shaft and drives through the bevel gears in the angle gearbox to the gearbox driveshaft and the main gearbox. General lubrication of the gears, bearings and gearshaft splines is accomplished by use of oil jets and oil splash.

All accessory drive components are plug-in units. The pad seals are spring loaded carbon which bear on a polished carburized surface. With the sole exception of the fuel pump, all accessory mount pads were designed with a pad cavity drain boss. The fuel pump/fuel metering unit combination has its cavity drain in the fuel pump housing.

2. Accessory Drives (Ref. Fig. 005)



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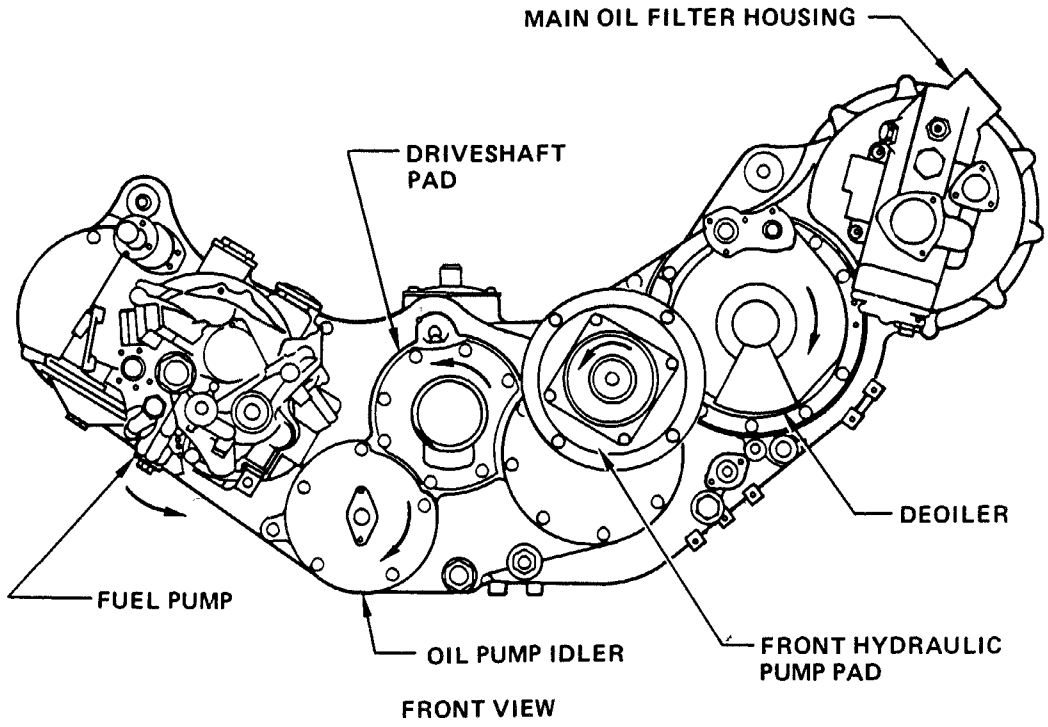
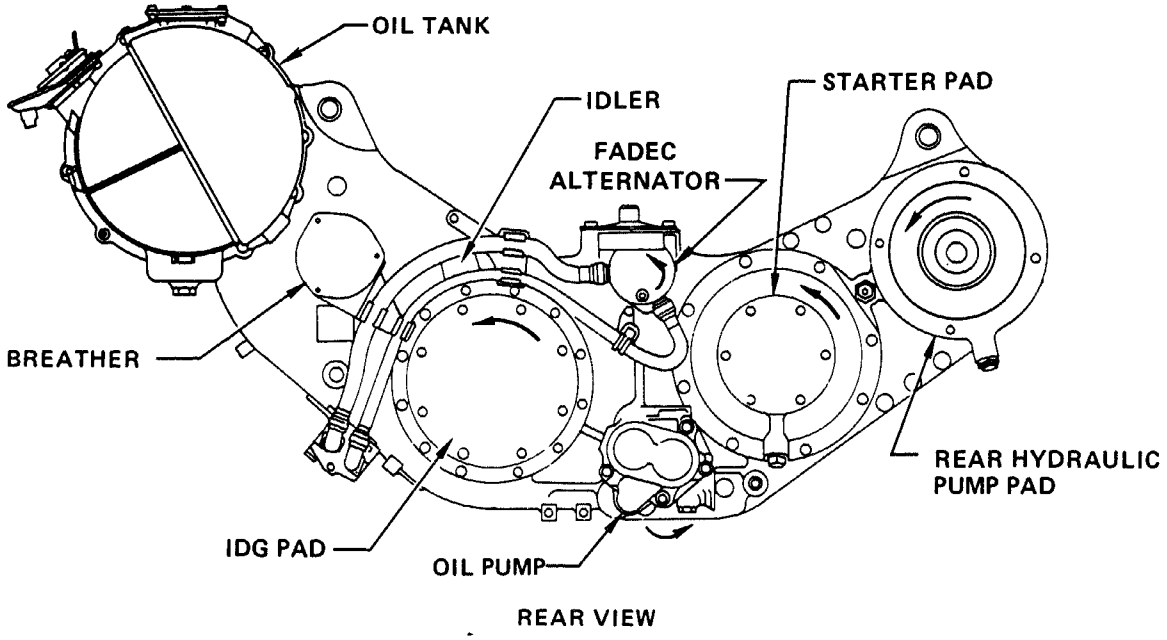
Main Gearbox
Figure 001



FRONT VIEW



REAR VIEW

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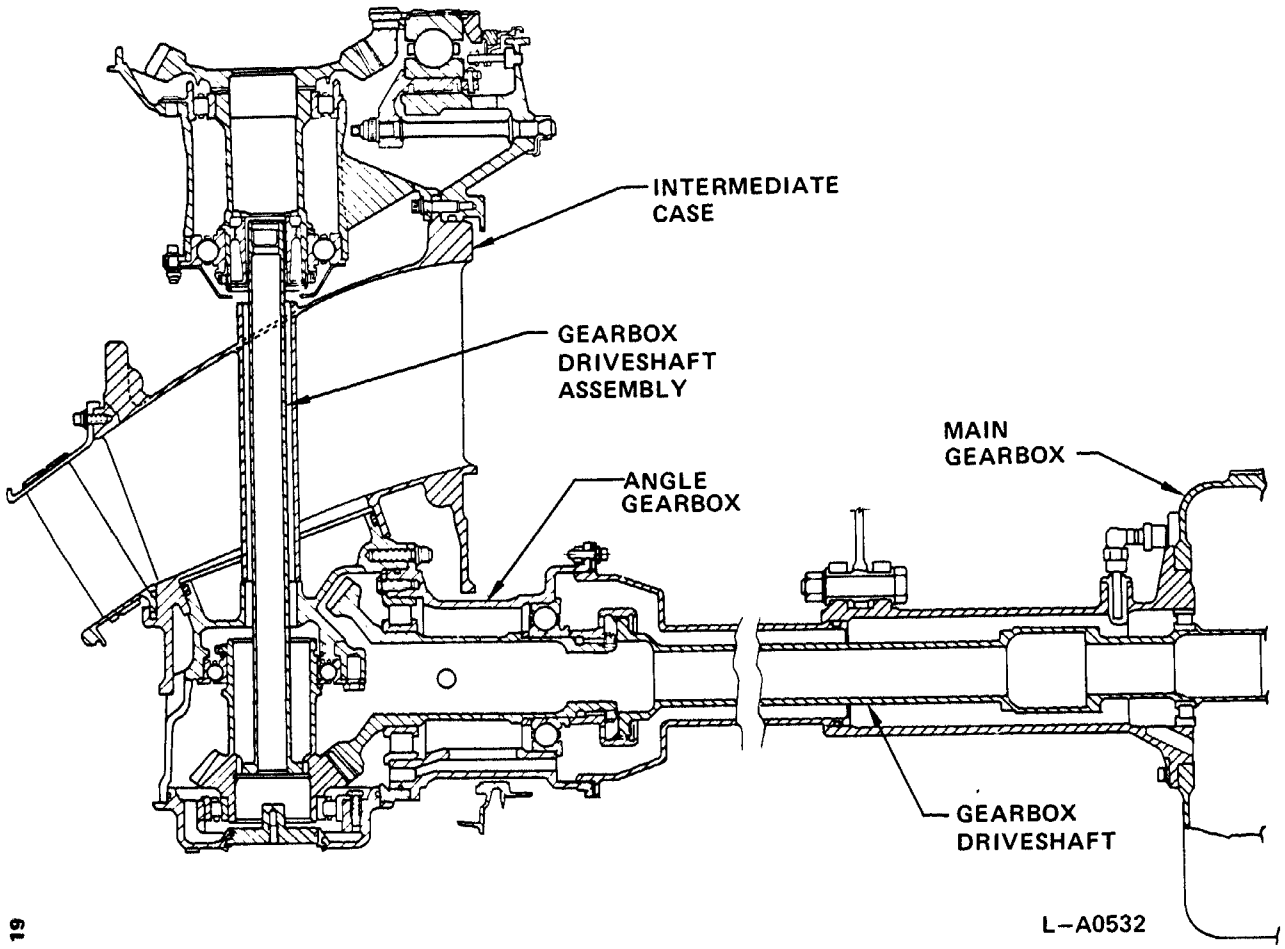
Main Gearbox Accessory Drives
Figure 002



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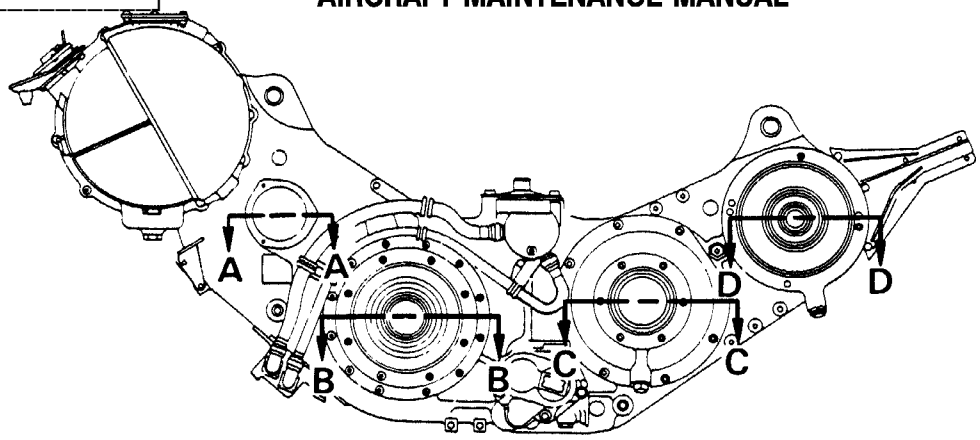
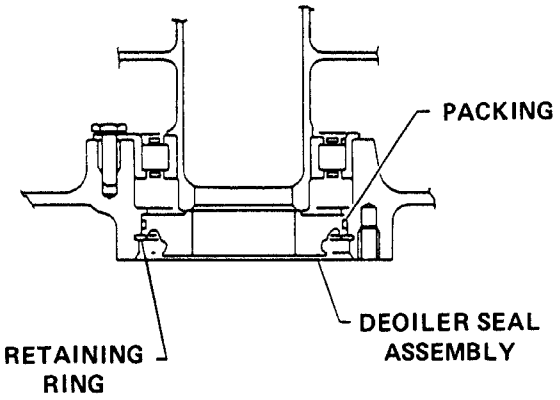
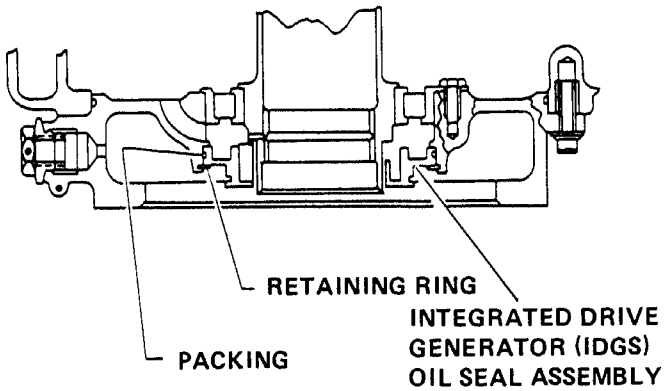
Main and Angle Gearbox Cross Section
Figure 003



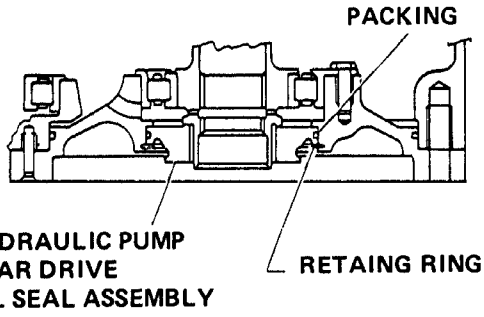
MAIN GEARBOX REAR VIEW



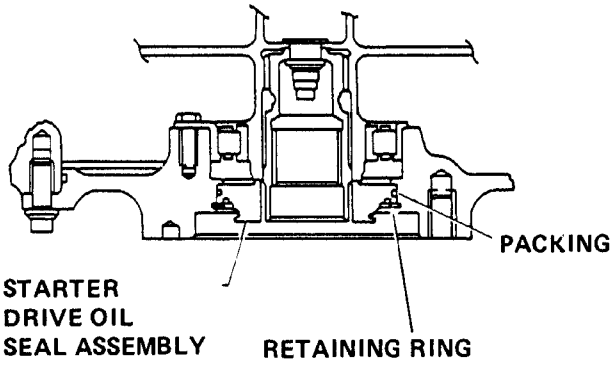
SECTION A - A L–A0136



SECTION B - B L–A0138



SECTION D - D L–A0141



SECTION C - C L–A0142

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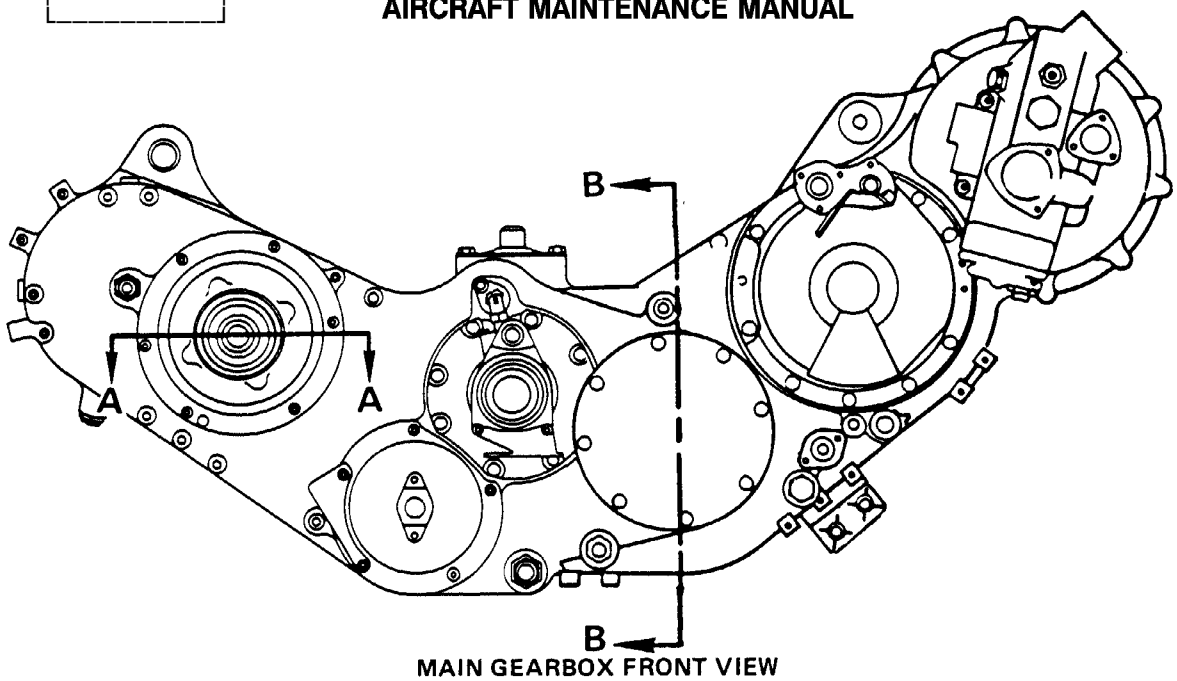
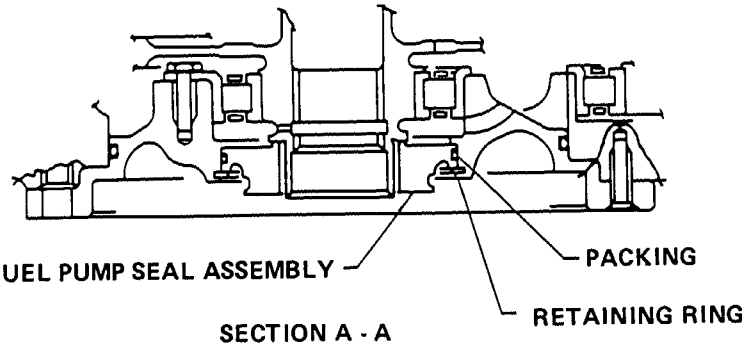
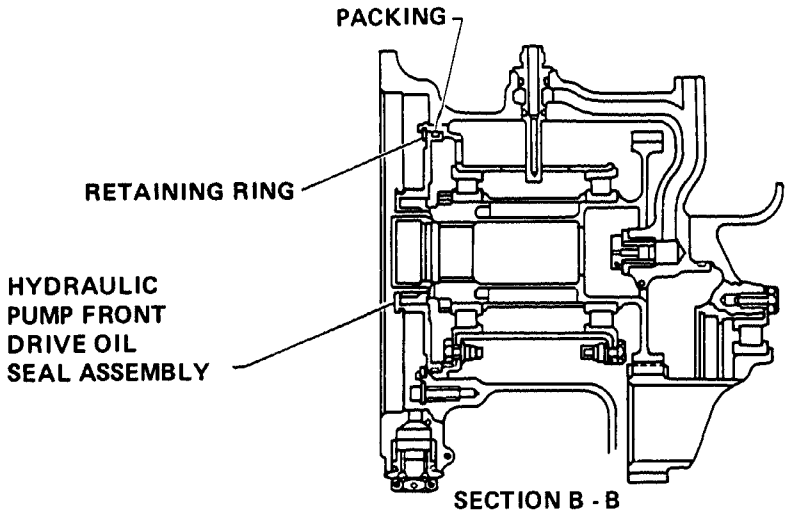
Main Gearbox Group
Figure 004







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Fuel Pump and Fuel Control Drive Seal
Figure 005

A. Starter Drive
The direction of rotation is counterclockwise. Starter drive coupling splines are not lubricated.

B. Integrated Drive Generator (IDG)
The direction of rotation is counterclockwise. The drive incorporates lubricated spline feature. The drive splines are lubricated by a stream of oil which is scooped into the center of the shaft, passes through the splines, and is discharged through seventeen radial holes in the shaft into the gearbox cavity.

C. Hydraulic Pump Rear Drive
The direction of rotation is counterclockwise. The drive shaft has positive oil lubrication introduced to the center of the shaft at the opposite end of the shaft by an oil nozzle. After passing through the splines, the oil is discharged into the main gearbox cavity through twelve radial holes in the drive shaft.

D. Hydraulic Pump Front Drive
The direction of rotation is counterclockwise. The drive shaft has positive oil lubrication introduced to the center of the shaft at the opposite end of the shaft by an oil nozzle.
After passing through the splines, the oil is discharged into the main gearbox cavity through twelve radial holes in the driveshaft.

E. Fuel Pump/Fuel Metering Unit Drive
The direction of rotation is clockwise. The drive shaft has positive oil lubrication introduced to the center of the shaft at the opposite end of the shaft by an oil nozzle. After passing through the splines, the oil is discharged into the main gearbox cavity through twelve radial holes in the drive shaft.

F. FADEC Alternator Drive
The direction of rotation is counterclockwise.

G. Lubrication and Scavenge Oil Pump Drive
The direction of rotation is counterclockwise.

H. Main Gearbox Bearings
In all main gearbox locations, the bearings are roller bearings. In locations where accessory drive shafts are supported, the outer races are flanged. Only the idler gear has the bearing inner race clamped. The flanged bearings have double-shouldered inner races and single shouldered outer races. Lubrication and cooling is accomplished by mist oil.

I. Main Gearbox Seals
The gearbox seal assemblies are spring loaded carbon face seals retained in an aluminum housing. The entire seal assembly is repairable/replaceable.

J. Gearbox Main Oil Pressure/Scavenge Pumps
The main oil pressure pump and the five scavenge pumps are all assembled in one housing and that housing is mounted on the rear face of the main gearbox housing.

K. Engine Deoiler
The deoiler is mounted on the front face of the main gearbox housing just to the left of and below the engine oil tank.

L. Engine Oil Filter
The main oil filter housing is mounted on the front face of the main gearbox housing at the forward end of the engine oil tank.

MAIN GEARBOX - INSPECTION/CHECK

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Torque Wrench
C. Material No.P03-001	Oils (Ref. 70-00-00)
D.	Packing
Referenced Procedures	
- 12-13-79, P. Block 1	Engines (Engine Oil System)
- 70-00-00, P. Block 201	Engine - Standard Practices
- 71-13-00, P. Block 301	Cowl Doors
- 79-11-02, P. Block 401	Oil Tank Cap
- 79-22-03, P. Block 401	Magnetic Plug
- 79-22-03, P. Block 601	Magnetic Plug

2. Inspect Main Gearbox for Oil Leakage, Cracks, and Corrosion

A. Job Set-Up

(1)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Procedure

WARNING : DO NOT PERMIT ENGINE OIL (P03-001) TO TOUCH SKIN OR PAINT FOR A LONG TIME. ENGINE OIL CAN CAUSE DERMATITIS AND SOFTEN PAINT.

R (1)Examine the main gearbox, oil pump, and oil tank for oil leaks from the magnetic chip collector assemblies. (Ref. Fig. 602). If there is a leak, refer to Table 601 for action.

SOURCE OF THE LEAK	REPLACE THE
Top of the valve	Probe packing and, if applicable, the valve packing (Ref. 79-22-03, P. Block 401).
Bottom of the valve	Assembly packing (Ref. 79-22-03, P. Block 401).

Table 601

(2)Examine the drain plugs and thermocouple probe in the main gearbox for leaks. (Ref. Fig. 601) If there is a leak :

CAUTION : WHEN YOU REMOVE A DRAIN PLUG, HOLD THE BUSHING WITH A WRENCH SO THAT IT DOES NOT TURN:

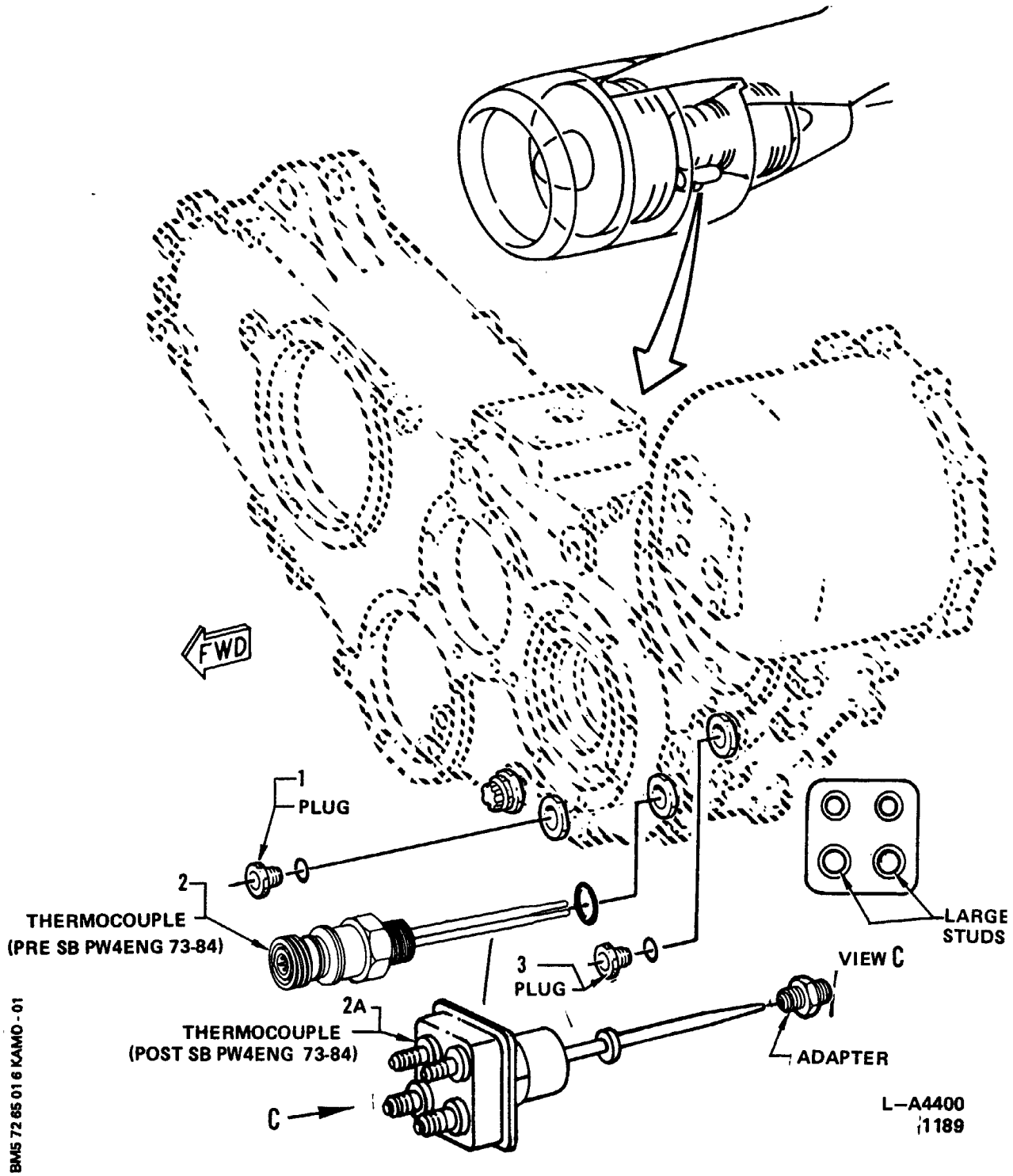
(a)Remove the plug/probe. Discard the packing. Permit the oil to drain.

(b)Apply Material No.P03-001 to a new packing and the threads of the plug/probe.

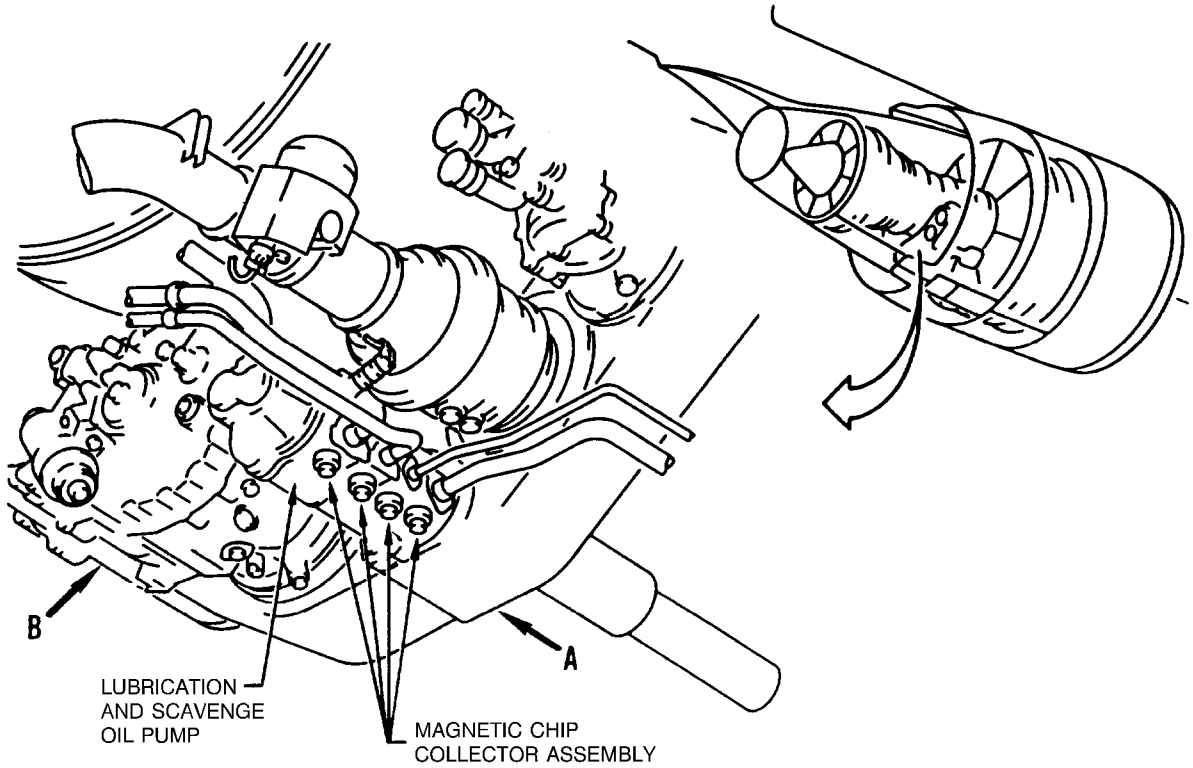
CAUTION : BE SURE TO INSTALL A PACKING ON THE PLUG/PROBE. IF THERE IS NO PACKING, THE ENGINE CAN LOSE A LARGE QUANTITY OF OIL AND THERE CAN BE AN ENGINE FAILURE.

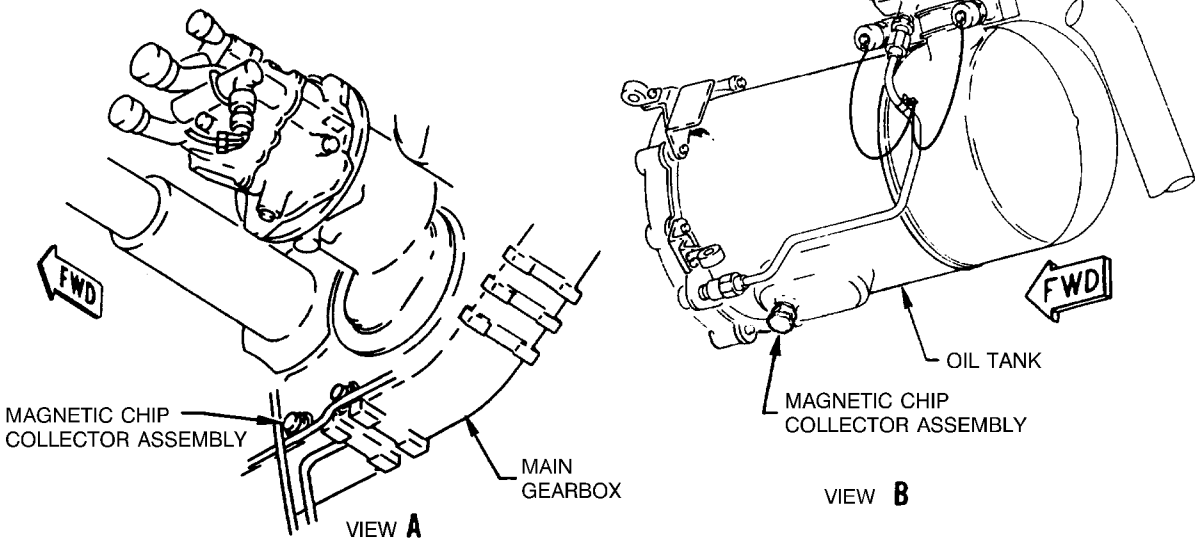
(c)Put the packing on the plug/probe.
(d)Install the plug/probe in the bushing.
CAUTION : WHEN YOU INSTALL A PLUG/PROBE, HOLD THE BUSHING WITH A WRENCH SO THAT IT DOES NOT TURN.
(e)TORQUE the nut (1) to between 110 and 120 lbf.in. (1.25 and 1.35 m.daN) and wirelock. TORQUE the nut (3) to between 150 and 170 lbf.in. (1.70 and 1.92 m.daN) and wirelock.
(f)For pre SB PW4ENG 73-84 engines, TORQUE the probe (2) to between 110 and 120 lbf.in. (1.25 and 1.35 m.daN) and wirelock.
(g)For post SB PW4ENG 73-84 engines, torque the probe as follows :
1 Remove the lockwire between the adapter and coupling nut. Loosen the coupling nut from the adapter. TORQUE the body nut (to the housing) to between 95 and 100 lbf.in. (1.08 and 1.12 m.daN) and wirelock the adapter to the gearbox lug.
2 Turn the probe so that the two larger studs are on the bottom and slightly outward from the engine center line. (Ref. Fig. 601)
3 TORQUE the coupling to between 95 and 100 lbf.in. (1.08 and 1.12 m.daN) and wirelock the coupling to the adapter.
(3)Examine the oil tank cap for leaks. If there is a leak from the stem of the cap, replace the packing in the cap. (Ref. 79-11-02, P. Block 401).
(4)Examine the main gearbox for cracks. A gearbox with cracks cannot continue in service.
(5)Examine the main gearbox housing for corrosion.
CAUTION : WITH A CLOTH SOAKED WITH A SPOP 208 SOLVENT (REF. 70-00-00, P. BLOCK 201), IMMEDIATELY REMOVE ANY WET OR BAKED ON HYDRAULIC FLUID FROM THE GEARBOX.
HYDRAULIC FLUID CAN CORRODE THE ALUMINUM HOUSING OF THE GEARBOX WHEN UNDER ENGINE OPERATING TEMPERATURES.
(a)Corroded areas that are less than 0.050 inch (0.127 mm) deep are permitted.
(b)If the depth of a corroded area is equal to, but not more than, 0.050 inch (0.127 mm), and has an area less than 1.00 inch^2 (645 mm^2), and is at least 2.00 inches (50.800 mm) away from other corroded areas, the part may continue in service.
(c)Corrosion that is more than the limits above is not permitted and the part may not continue in service.

C. Close-Up
(1)If a plug/probe was removed, service the oil system. (Ref. 12-13-79, P. Block 1).
(2)Close fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.



Location of Drain Plugs and Thermocouple Probe
Figure 601





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Location of Magnetic Chip Collector Assemblies
Figure 602

R

1. Main Gearbox Shaft Seal Face Cleaning

A. Equipment and Materials

ITEM	DESIGNATION
(1)PWA 27357	Lapping Tools : (for Hydraulic Pump Shaft)
(2)PWA 27357	Lapping Tools : (for Fuel Pump Shaft)
(3)PWA 27357	Lapping Tools : (for Aux. Hydraulic Pump Shaft)
(4)PWA 27443	Lapping Tools : (for Starter Shaft)
(5)PWA 27444	Lapping Tools : (for Deoiler Shaft)
(6)PWA 102096	Lapping Tools : (for IDGS Shaft)
(7)PWA 102097	Lapping Tools : (for Deoiler Shaft (option to PWA 27444))
(8)Material No.P05-006	Special Materials (Ref. 70-00-00)
(9)Material No.P05-038	Special Materials (Ref. 70-00-00)
10)	Plastic Scrapper
11)	Soft Brush
Referenced Procedure - 71-13-00, P. Block 301	Cowl Doors

NOTE : Remove starter coupling prior to use of lapping tool PWA 27443.

CAUTION : PREVENT LAPPING COMPOUND AND/OR SPOP 2 ALKALINE GEL FROM FALLING INTO GEARBOX AND ENTERING OIL SYSTEM. OIL CONTAMINATION MAY OCCUR AND BEARINGS MAY BE DAMAGED.

NOTE : Sized cheese cloth contains resin binders that can dissolve in solvents or alkaline gel causing contamination of surface. An unsized cheese cloth is not sticky when new.

B. Job Set-Up

(1)Open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

C. Prefered Cleaning Procedure

(1)Pack the area around the gearshaft with clean unsized Cheese Cloth (Material No.P05-038) to prevent any lapping compound to fall into the gearbox. Make sure that the gearshaft seal face is fully exposed.

(2)Using the appropriate lapping tool, scrape off any carbon deposits from the gearshaft seal face at the point of interface with the carbon seal.

(a)Use the lapping tool with a standard 0.375 in. (9.525 mm) square drive "T" handle, or equivalent. Use Lapping Compound (Material No.P05-006) to lap the gearshaft with tool by hand with axial pressure applied to obtain the desired effect. Clean and recharge the lapping tool with fresh lapping compound as necessary.

1 For heavy carbon buildups, prior to final lapping, it is necessary to resurface the tool by lapping it on the appropriate flat plate to

restore the tool face wavyness to within 0.0003 in. (0.0076 mm) and surface finish of 10 µin. (0.25 µm).

NOTE : Remove starter coupling prior to use of lapping tool PWA 27443.

(b)Wipe the lapped gearshaft seal surface and the adjacent areas with a clean, unsized dry Cheese Cloth (Material No.P05-038) and carefully remove the cloth previously inserted around the gearshaft.

(c)Wipe off any lapping compound residue and visually inspect the gearshaft area to make sure that no lapping compound particles have fallen into the gearbox.

NOTE : The lapping tool will remove only carbon buildup and is not recommended for the repair of scored gearshaft seal faces.

D. Optional Cleaning Procedure

CAUTION : ALKALINE GEL (SPOP 2) MAY CAUSE DAMAGE TO PROTECTIVE COATINGS ON ALUMINUM PARTS. IF ANY ALKALINE GEL GETS IN CONTACT WITH ANY ALUMINUM SURFACE, WIPE IT OFF IMMEDIATELY WITH A CLEAN DAMP UNSIZED CHEESE CLOTH FOLLOWED BY A WIPING WITH MATERIAL NO.P05-038.

(1)Pack the area around the gearshaft with clean unsized Cheese Cloth (Material No.P05-038).

(2)Remove light carbon deposits (stains) as follows :

(a)With a paint brush of appropriate size, apply a thin coat of SPOP 2 alkaline gel directly to the gearshaft seal face. Let the gel work for a minimum of 15 minutes.

(b)Wipe the gearshaft seal face with a dry clean unsized Cheese Cloth (Material No.P05-038). If necessary, reapply alkaline gel to the gearshaft seal face followed by a wipe with a clean dry unsized Cheese Cloth (Material No.P05-038).

(c)Use a clean damp unsized Cheese Cloth (Material No.P05-038) to wipe the entire area where the alkaline gel was applied and follow with a wipe with a dry unsized Cheese Cloth (Material No.P05-038).

(3)Remove heavy carbon deposits as follows :

(a)With a paint brush of appropriate size, apply a thin coat of SPOP 2 alkaline gel directly to the gearshaft seal face. Let the gel work for a minimum of 20 to 30 minutes to allow the carbon deposits to soften.

(b)Scrape off the softened carbon deposit using a plastic scraper. Wipe the excess off with a clean dry unsized Cheese Cloth (Material No.P05-038). Repeat this procedure until only a thin layer of carbon deposit remains.

(c)Use a clean damp unsized Cheese Cloth (Material No.P05-038) to wipe the entire area where the alkaline gel was applied and follow with a wipe with a dry unsized Cheese Cloth (Material No.P05-038).

(d)Pack the area around the gearshaft with clean unsized Cheese Cloth (Material No.P05-038) to prevent any lapping compound to fall into the gearbox. Make sure that the gearshaft seal face is fully exposed.

(e)Using the appropriate lapping tool, remove any remaining carbon deposits from the gearshaft seal face at the point of interface with the carbon seal.

1 Use the lapping tool with a standard 0.375 in. (9.525 mm) square drive "T" handle, or equivalent. Use Lapping Compound (Material No.P05-006) to lap the gearshaft with tool by hand with axial pressure

applied to obtain the desired effect. Clean and recharge the lapping tool with fresh lapping compound as necessary.

2 Prior to final lapping, it may be necessary to resurface the tool by lapping it on the appropriate flat plate to restore the tool face wavyness to within 0.0003 in. (0.0076 mm) and surface finish of 10 µin. (0.25 µm).

NOTE : Remove starter coupling prior to use of lapping tool PWA 27443.

(f)Wipe the lapped gearshaft seal surface and the adjacent areas with a clean, unsized dry Cheese Cloth (Material No.P05-038) and carefully remove the cloth previously inserted around the gearshaft.

(g)Wipe off any lapping compound residue and visually inspect the gearshaft area to make sure that no lapping compound particles have fallen into the gearbox.

NOTE : The lapping tool will remove only carbon buildup and is not recommended for the repair of scored gearshaft seal faces.

E. Close-Up

(1)Close thrust reverser and fan cowl doors (Ref. 71-13-00, P. Block 301).

DEOILER DRIVE OIL SEAL ASSEMBLY - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. PWA88110	Puller
C. PWA85204	Puller (Optional to PWA88110)
D. Material No.P03-001	Oils (Ref. 70-00-00)
E.	Packing
F.	Protective Caps
Referenced Procedures	
- 12-13-79, P. Block 1	Engines (Engine Oil System)
- 24-11-11, P. Block 401	Integrated Drive Generator (IDG)
- 71-00-00, P. Block 501	Power Plant General
- 71-13-00, P. Block 301	Cowl Doors
R - 72-65-11, P. Block 401	Main Oil Filter Housing

2. Procedure

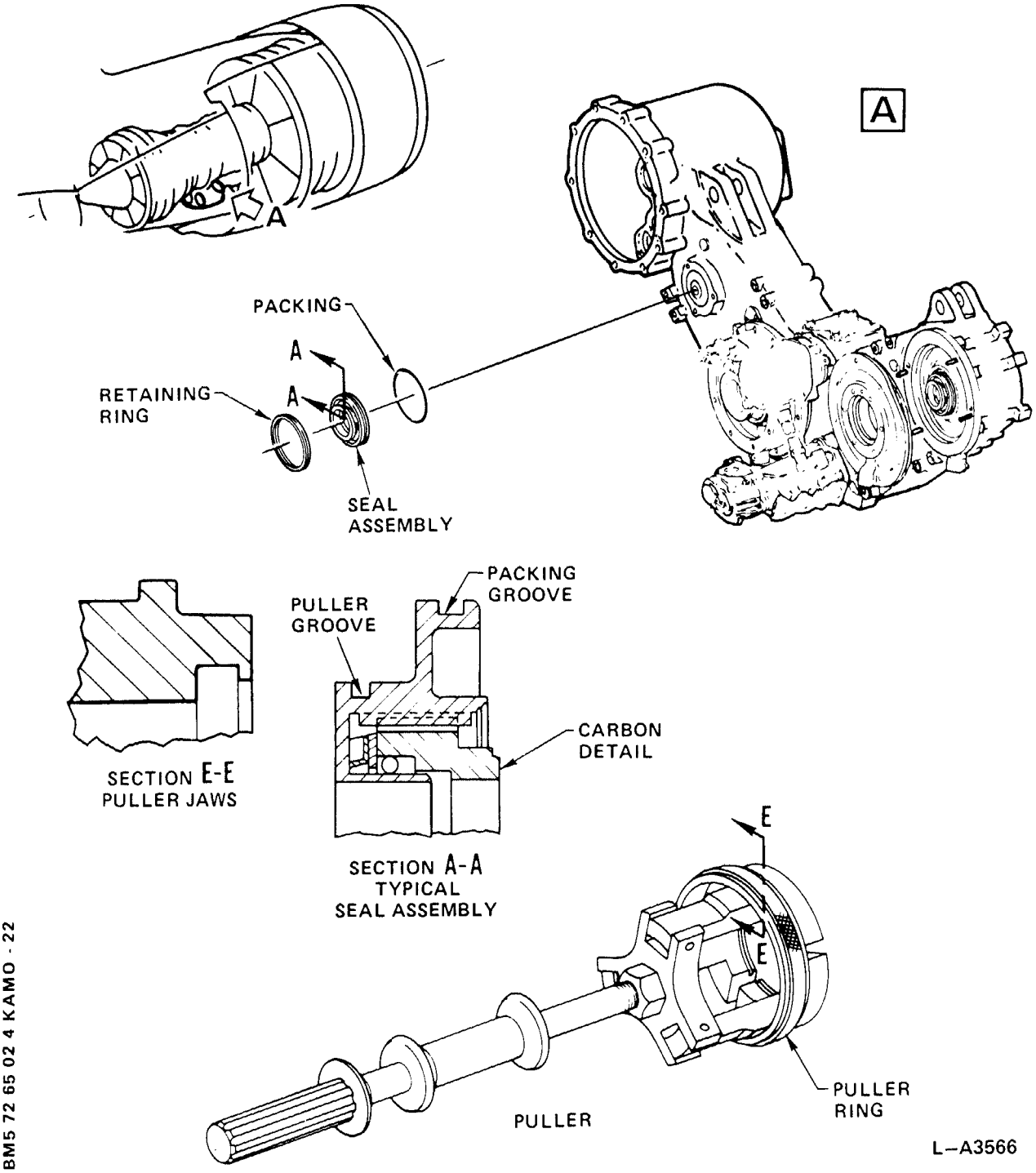
A. Job Set-Up
(1) Open, safety and tag circuit breakers for appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
R (2) Remove integrated drive generator (Ref. 24-11-11, P. Block 401), if
R necessary to gain access.
R (3) Remove main oil filter hose and tube assembly (Ref. 72-65-11, P. Block
R 401), if necessary to gain access.

B. Removal (Ref. Fig. 401)
(1) Disconnect forward vent duct from rear vent duct.
(2) Remove three bolts attaching two brackets and vent duct to main gearbox. Remove forward vent tube.
(3) Remove retaining ring securing deoiler oil seal assembly in ejector port on rear of gearbox.
(4) Install either PWA88110 or PWA85204 puller in oil seal assembly and secure.
(a) Engage puller jaws in groove of seal assembly.
(b) Slide down puller ring until jaws are secured into groove.
(5) Remove oil seal assembly using slide hammer action of puller. Remove puller. Discard packing.
(6) Install protective closure.

C. Installation (Ref. Fig. 401)
(1) Remove protective closure.
(2) Lubricate new preformed packing with Material No.P03-001, and position in groove of oil seal assembly.
(3) Lubricate carbon detail surface of face seal assembly with Material No.P03-001.
(4) Install oil seal assembly into deoiler ejector port to seat against end of gearshaft.

(5)Install retaining ring in groove in ejector port of gearbox to secure seal assembly in place.
(6)Position forward vent duct and two brackets on main gearbox and install three bolts and washers. Do not torque bolts at this time.
(7)Secure forward vent duct to rear duct with duct connector. Check for correct alignment of vent ducts and ensure that ducts are not subject to preloading.
(8)TORQUE three bolts at forward end of forward duct to between 65 and
R 75 lbf.in. (0.73 and 0.85 m.daN).
(9)TORQUE vent duct connector to between 950 and 1050 lbf.in. (10.73 and 11.86 m. daN).
R (10)Install integrated drive generator (Ref. 24-11-11, P. Block 401), if
R removed.
R (11)Install the main oil filter hose and tube assembly (Ref. 72-65-11,
R P. Block 401), if removed.

D. Close-Up
(1)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(2)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(3)Service engine oil system (Ref. 12-13-79, P. Block 1).
(4)Test engine per test reference table (Ref. 71-00-00, P. Block 501).



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Deoiler Oil Seal Assembly
Figure 401

STARTER DRIVE OIL SEAL ASSEMBLY - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. PWA88110	Puller
C. PWA85204	Puller (Optional to PWA88110)
D. Material No.P03-001	Oils (Ref. 70-00-00)
E.	Packing
F.	Protective Caps
Referenced Procedures	
- 12-13-79, P. Block 1	Engines (Engine Oil System)
- 71-00-00, P. Block 501	Power Plant-General
- 71-13-00, P. Block 301	Cowl Doors
- 80-13-01, P. Block 401	Pneumatic Starter Assy

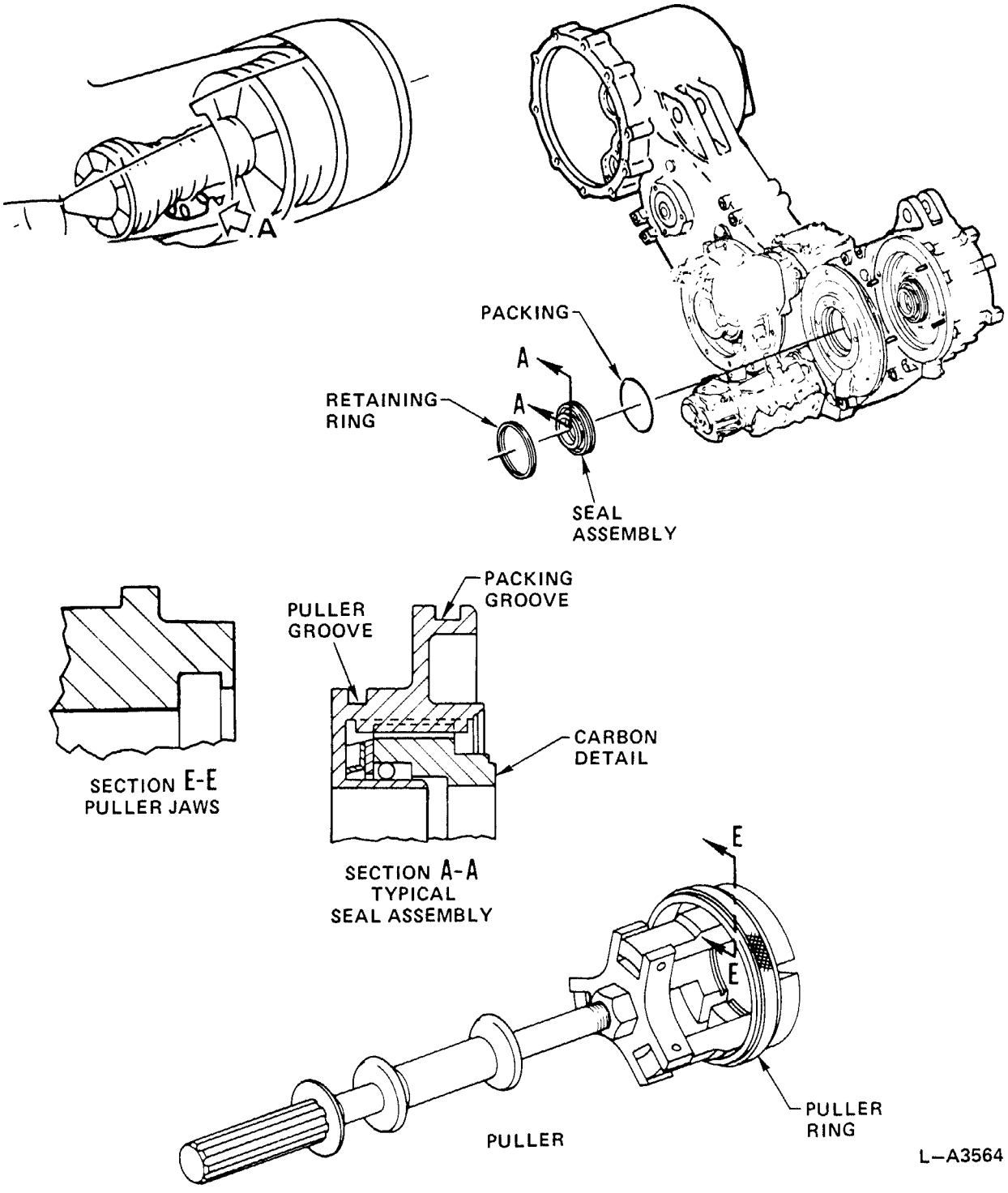
2. Procedure

A. Job Set-Up
(1)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove pneumatic starter assembly (Ref. 80-13-01, P. Block 401).

B. Removal (Ref. Fig. 401)
(1)Remove retaining ring securing starter drive oil seal assembly.
(2)Install either PWA88110 or PWA85204 Puller in seal assembly.
(a)Engage puller jaws with groove of seal assembly.
(b)Slide down puller ring until jaws are secured into groove.
(3)Remove oil seal assembly using slide hammer action of puller to overcome resistance of preformed packing. Remove puller. Discard packing.
(4)Install protective closure.

C. Installation (Ref. Fig. 401)
(1)Remove protective closure.
(2)Lubricate new preformed packing with Material No.P03-001, and position in groove of starter drive oil seal assembly.
(3)Lubricate carbon detail of face seal assembly with Material No.P03-001.
(4)Install oil seal assembly starter drive pad over end of gearshaft to seat against face of starter drive coupling. Secure with retaining ring.

D. Close-Up
(1)Install pneumatic starter assembly (Ref. 80-13-01, P. Block 401).
(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(3)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(4)Service oil system (Ref. 12-13-79, P. Block 1).
(5)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).



BM5 72 65 03 4 KAMO - 22

Starter Drive Oil Seal Assembly
Figure 401

INTEGRATED DRIVE GENERATOR (IDG) DRIVE OIL SEAL ASSEMBLY REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. PWA85203	Puller
C. Material No.P03-001	Oil (Ref. 70-00-00)
D.	Packing
E.	Protective Caps
Referenced Procedures	
- 12-13-79, P. Block 1	Engines (Engine Oil System)
- 24-11-11, P. Block 401	Integrated Drive Generator
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

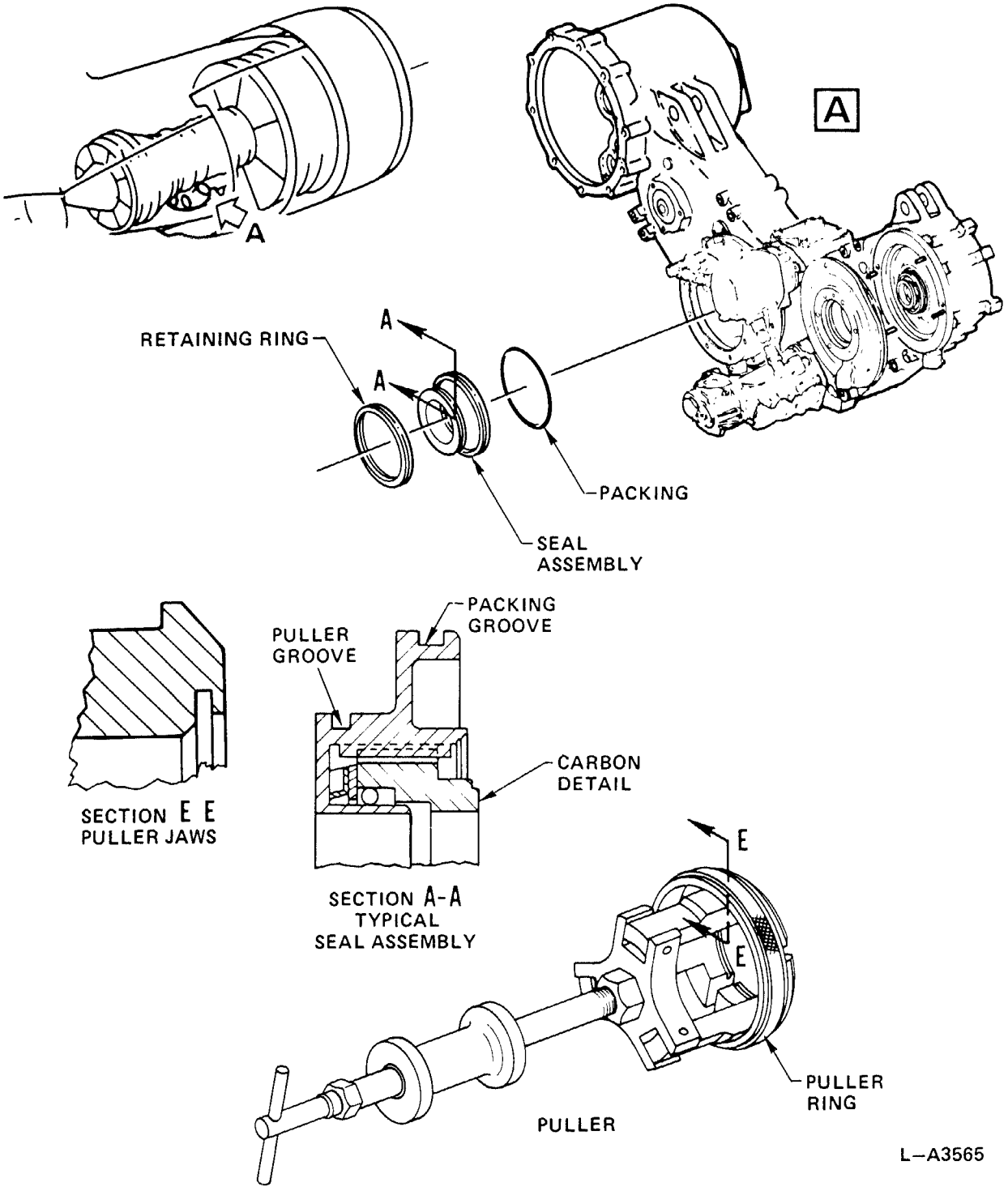
2. Procedure

A. Job Set-Up
(1)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove integrated drive generator (Ref. 24-11-11, P. Block 401).

B. Removal (Ref. Fig. 401)
(1)Remove retaining ring securing IDG drive oil seal assembly.
(2)Install PWA85203 Puller in seal assembly.
(a)Engage puller jaws in groove of seal assembly.
(b)Slide puller ring into position over jaws to secure in place.
(3)Remove oil seal assembly using slide hammer action of puller to overcome resistance of preformed packing. Remove puller. Discard packing.
(4)Install protective closure.

C. Installation (Ref. Fig. 401)
(1)Lubricate new preformed packing with Material No.P03-001, and position in groove of integrated drive generator (IDG) drive oil seal assembly.
(2)Lubricate carbon detail of face seal assembly with Material No.P03-001.
(3)Install oil seal assembly IDG pad over end of gearshaft to seat against flange of gear.
(4)Install retaining ring in groove in gearbox housing to secure seal assembly in place.

D.Close-Up
(1)Install integrated drive generator (Ref. 24-11-11, P. Block 401).
(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(3)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(4)Service oil system (Ref. 12-13-79, P. Block 1).
(5)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).



BM5 72 65 04 4 KAMO - 22

Integrated Drive Generator (IDG) Drive Oil Seal Assembly
Figure 401

FADEC ALTERNATOR DRIVE OIL SEAL ASSEMBLY - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. PWA85723	Puller
C. Material No.P03-001	Oil (Ref. 70-00-00)
D.	Packings
E.	Protective Caps
Referenced Procedures	
- 12-13-79, P. Block 1	Engines (Engine Oil System)
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
R - 73-24-01, P. Block 401	Permanent Magnet Alternator
- 80-13-01, P. Block 401	Pneumatic Starter

2. Procedure

A. Job Set-Up
(1)Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove pneumatic starter (Ref. 80-13-01, P. Block 401).
R (3)Remove FADEC alternator stator (Ref. 73-24-01, P. Block 401).
R (4)Remove FADEC alternator rotor (Ref. 73-24-01, P. Block 401).

B. Removal (Ref. Fig. 401, 402)
(1)Remove retaining ring securing FADEC alternator drive oil seal assembly.
(2)Install PWA85723 Puller to seal assembly and secure.
(a)Engage puller jaws in groove of seal assembly.
(b)Tighten down puller ring until jaws are secured in groove.
(3)Remove oil seal assembly using slide hammer action of puller to overcome resistance of preformed packing. Remove puller. Discard packing.
(4)If there is the possibility of damage to seal seat, remove sleeve spacer, discard packing, and remove seal seat. Examine seal seat for damage.
(5)Install protective closure.

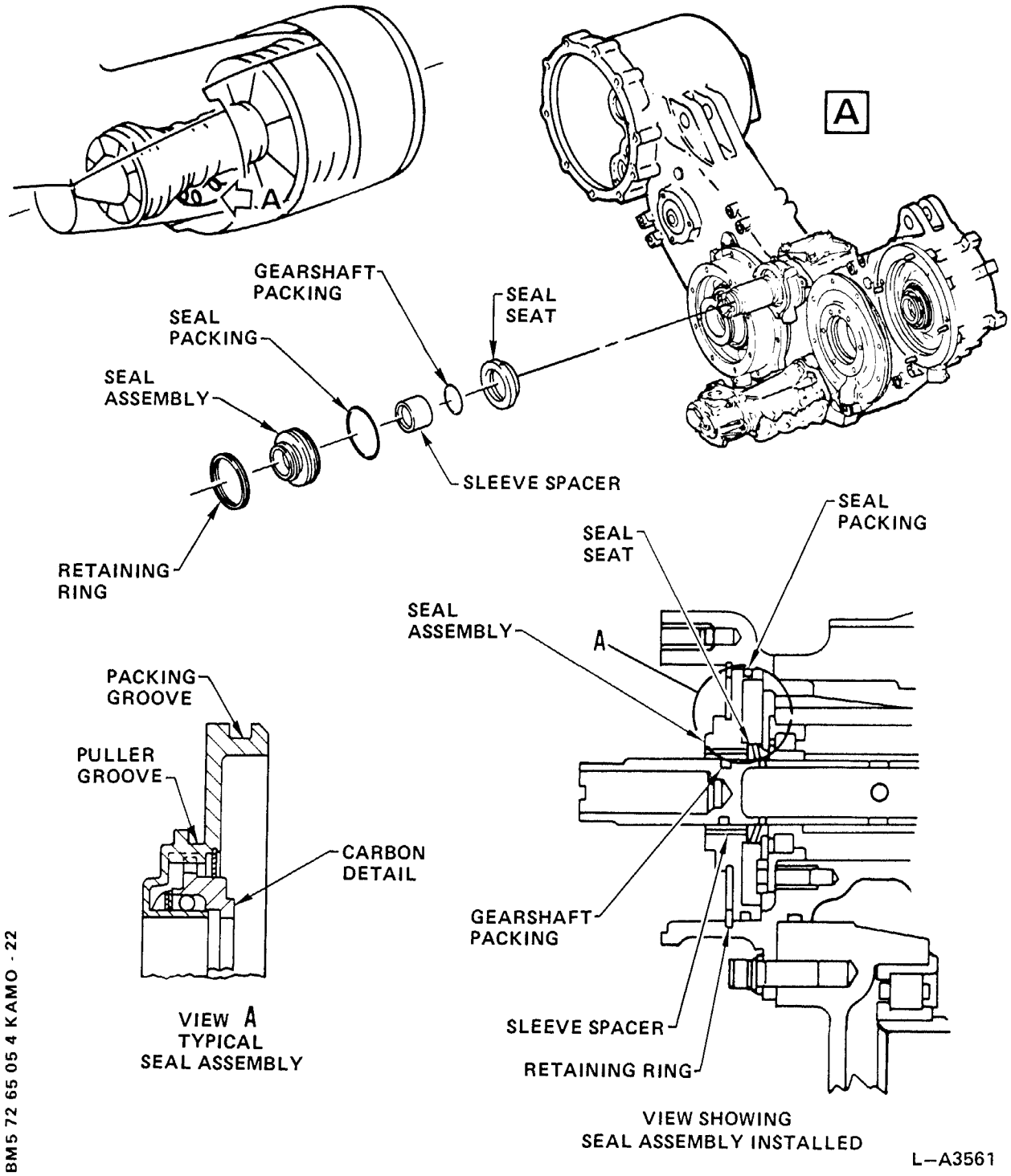
C. Installation (Ref. Fig. 401)
(1)Remove protective closure from FADEC alternator shaft on upper rear face of gearbox.
(2)If required, install seal seat, small OD stepped face inward, over stud (threaded) end of alternator gearshaft. Install Material No.P03-001, lubricated packing to groove in FADEC alternator shaft. Install sleeve spacer onto shaft over above installed packing.

(3)Lubricate new preformed packing with material No.P03-001, and position in groove of alternator drive oil seal and housing assembly.
(4)Lubricate carbon detail of face seal assembly with Material No.P03-001.
(5)Install oil seal assembly over stud end of gearshaft to seat against previously installed seal seat.

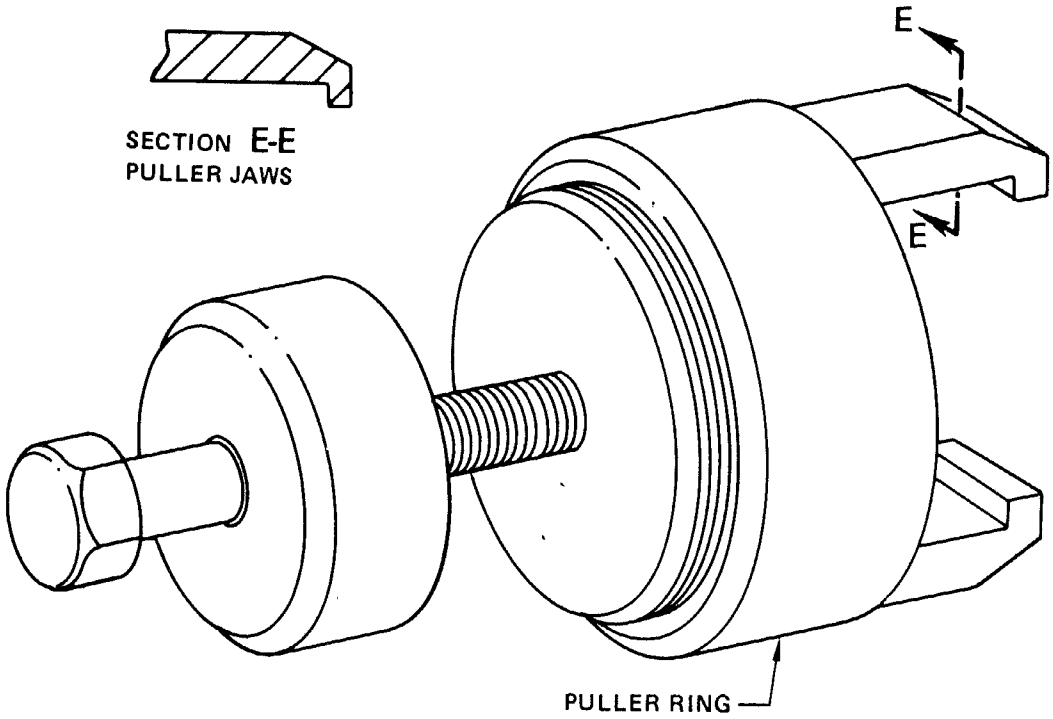
(6)Secure seal assembly in place with retaining ring.

D. Close-Up

R (1)Install FADEC alternator rotor (Ref. 73-24-01, P. Block 401).
R (2)Install FADEC alternator stator (Ref. 73-24-01, P. Block401).
(3)Install pneumatic starter (Ref. 80-13-01, P. Block 401).
(4)Service oil system (Ref. 12-13-79, P. Block 1).
(5)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block301).
(6)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).



FADEC Alternator Drive Oil Seal Assembly
Figure 401



BM5 72 65 05 4 KCMO - 24 - 19
DM5

L—A4295

Puller
Figure 402

FUEL PUMP DRIVE OIL SEAL ASSEMBLY - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. PWA88110	Puller
C. PWA85204	Puller (Optional to PWA88110)
D. Material No.P03-001	Oils (Ref. 70-00-00)
E.	Packings
F.	Protective Caps
Referenced Procedures	
- 12-13-79, P. Block 1	Engines (Engine Oil System)
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 73-12-01, P. Block 401	Fuel Pump

2. Procedure

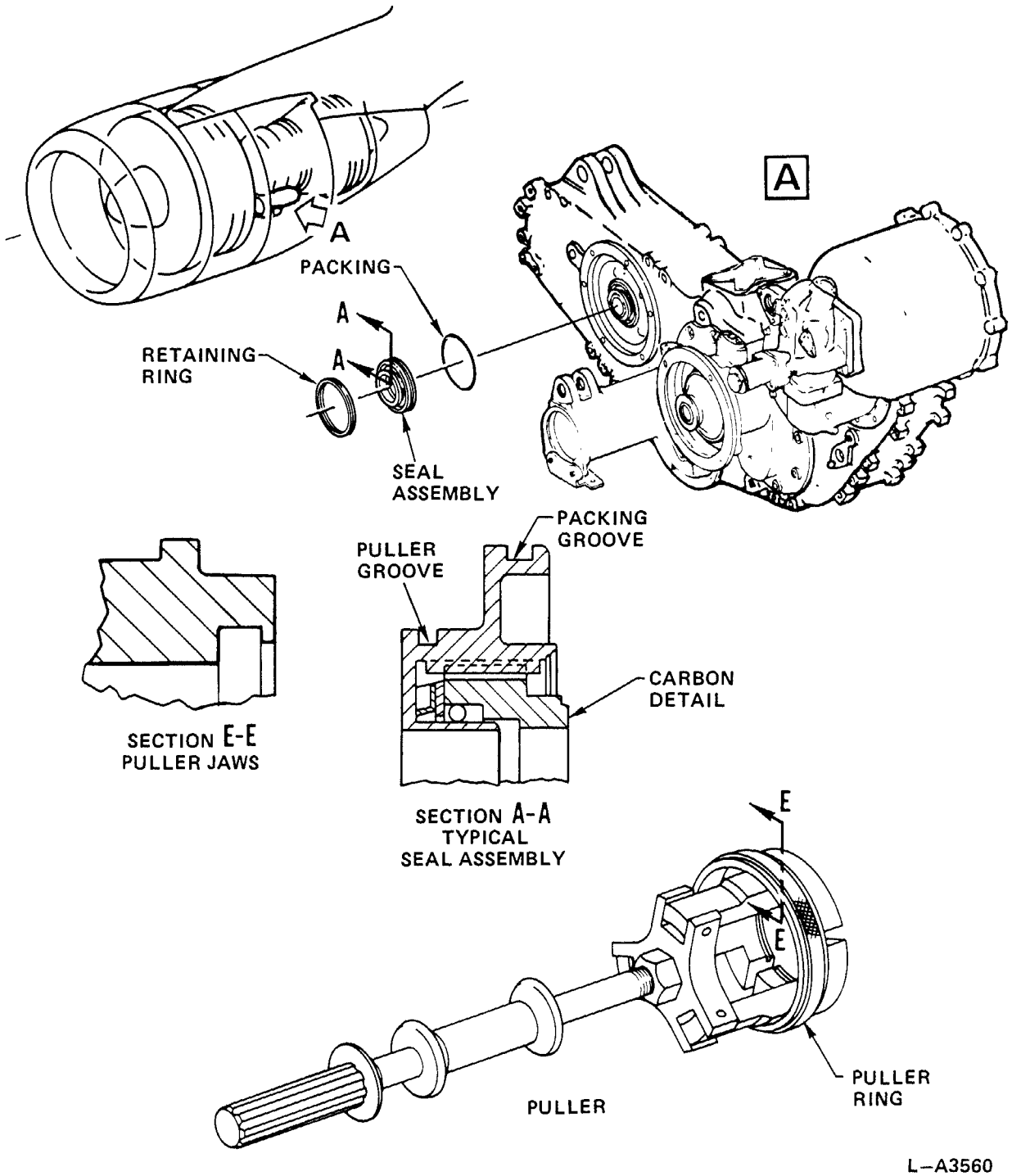
A. Job Set-Up
(1) Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2) Remove fuel pump and fuel metering unit package (Ref. 73-12-01, P. Block 401).

B. Removal (Ref. Fig. 401)
(1) Remove retaining ring securing fuel pump drive oil seal assembly to pad on right front side of gearbox.
(2) Install either PWA88110 or PWA 85204 Puller to oil seal assembly and secure.
(a) Engage puller jaws in groove of seal assembly.
(b) Slide down puller ring until jaws are secured in groove.
(3) Remove oil seal assembly using slide hammer action of puller to overcome resistance of preformed packing.
Remove puller. Discard packing.
(4) Install protective closure.

C. Installation (Ref. Fig. 401)
(1) Remove protective closure.
(2) Lubricate new preformed packing with Material No.P03-001, and position in groove of fuel pump drive oil seal assembly.
(3) Lubricate carbon detail of face seal assembly with Material No.P03-001
(4) Install oil seal and assembly in fuel pump drive pad over end of gearshaft to seat against shoulder on drive gear.
(5) Secure seal assembly in place with retaining ring installed in groove in gearbox housing.

D. Close-Up
(1) Install fuel pump and fuel metering unit package (Ref. 73-12-01, P. Block 401).

(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(3)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(4)Service oil system (Ref. 12-13-79, P. Block 1).
(5)Test engine per test reference table (Ref. 71-00-00, P. Block 501).



Fuel Pump Drive Oil Seal Assembly
Figure 401

HYDRAULIC PUMP REAR DRIVE OIL SEAL ASSEMBLY - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. PWA88110	Puller
C. PWA85204	Puller (Optional to PWA88110)
D. Material No.P03-001	Oils (Ref. 70-00-00)
E.	Packing
Referenced Procedures	
- 12-13-79, P. Block 1	Engines (Engine Oil System)
- 29-11-32, P. Block 401	Engine Pump
- 71-00-00, P. Block 501	Power Plant-General
- 71-13-00, P. Block 301	Cowl Doors

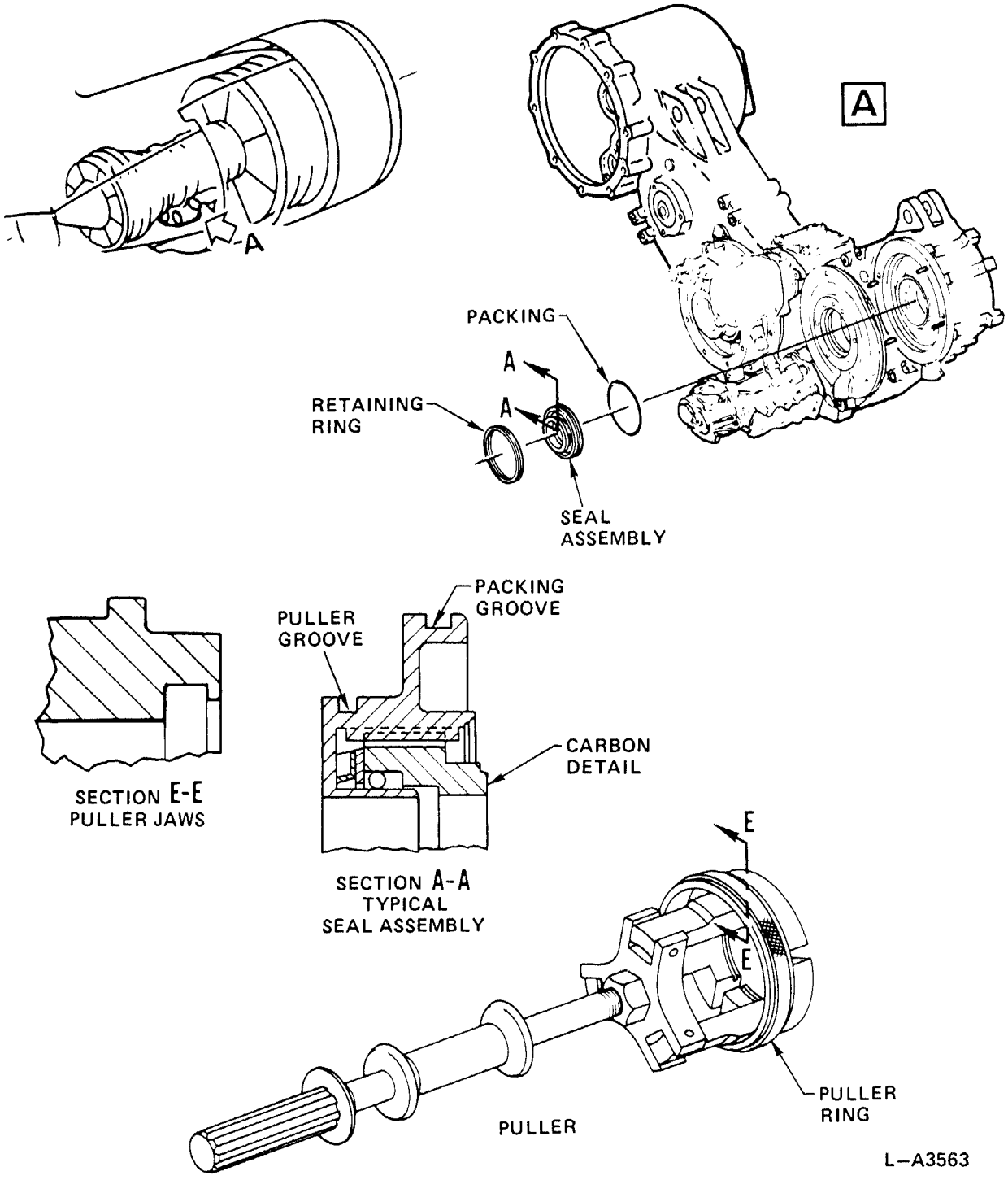
2. Procedure

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open the right thrust reverser door (Ref. 71-13-00, P. Block 301).
(2)Remove rear hydraulic pump (Ref. 29-11-32, P. Block 401).

B. Removal (Ref. Fig. 401)
(1)Remove retaining ring securing hydraulic pump drive oil seal assembly.
(2)Install either PWA88110 or PWA 85204 Puller to oil seal assembly and secure.
(a)Engage puller jaws in groove of seal assembly.
(b)Slide down puller ring until jaws are secured in groove.
(3)Remove oil seal assembly using slide hammer action of puller to overcome resistance of preformed packing. Remove puller. Discard packing.
(4)Install protective closure.

C. Installation (Ref. Fig. 401)
(1)Remove protective closure.
(2)Lubricate new preformed packing with Material No.P03-001, and position in groove of hydraulic pump drive oil seal and assembly.
(3)Lubricate carbon detail of face seal assembly with Material No.P03-001
(4)Install oil seal assembly in hydraulic pump drive pad located over end of gearshaft to seat against shoulder on gearshaft.
(5)Secure seal assembly in place with retaining ring.

D. CLose-Up
(1)Install rear hydraulic pump (Ref. 29-11-32, P. Block 401).
(2)Close thrust reverser doors (Ref. 71-13-00, P. Block 301). Remove safety clips and tags and close circuit breakers.
(3)Service oil system (Ref. 12-13-79, P. Block 1).
(4)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).



BM5 72 65 07 4 KAMO - 22

Hydraulic Pump Rear Drive Oil Seal Assembly
Figure 401

HYDRAULIC PUMP FRONT DRIVE OIL SEAL ASSEMBLY - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. PWA88110	Puller
C. PWA85204	Puller (Optional to PWA88110)
D. Material No.P03-001	Oils (Ref. 70-00-00)
E.	Packing
F.	Protective Caps
Referenced Procedures	
- 29-11-32, P. Block 401	Pump - Engine - Drive
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

2. Procedure

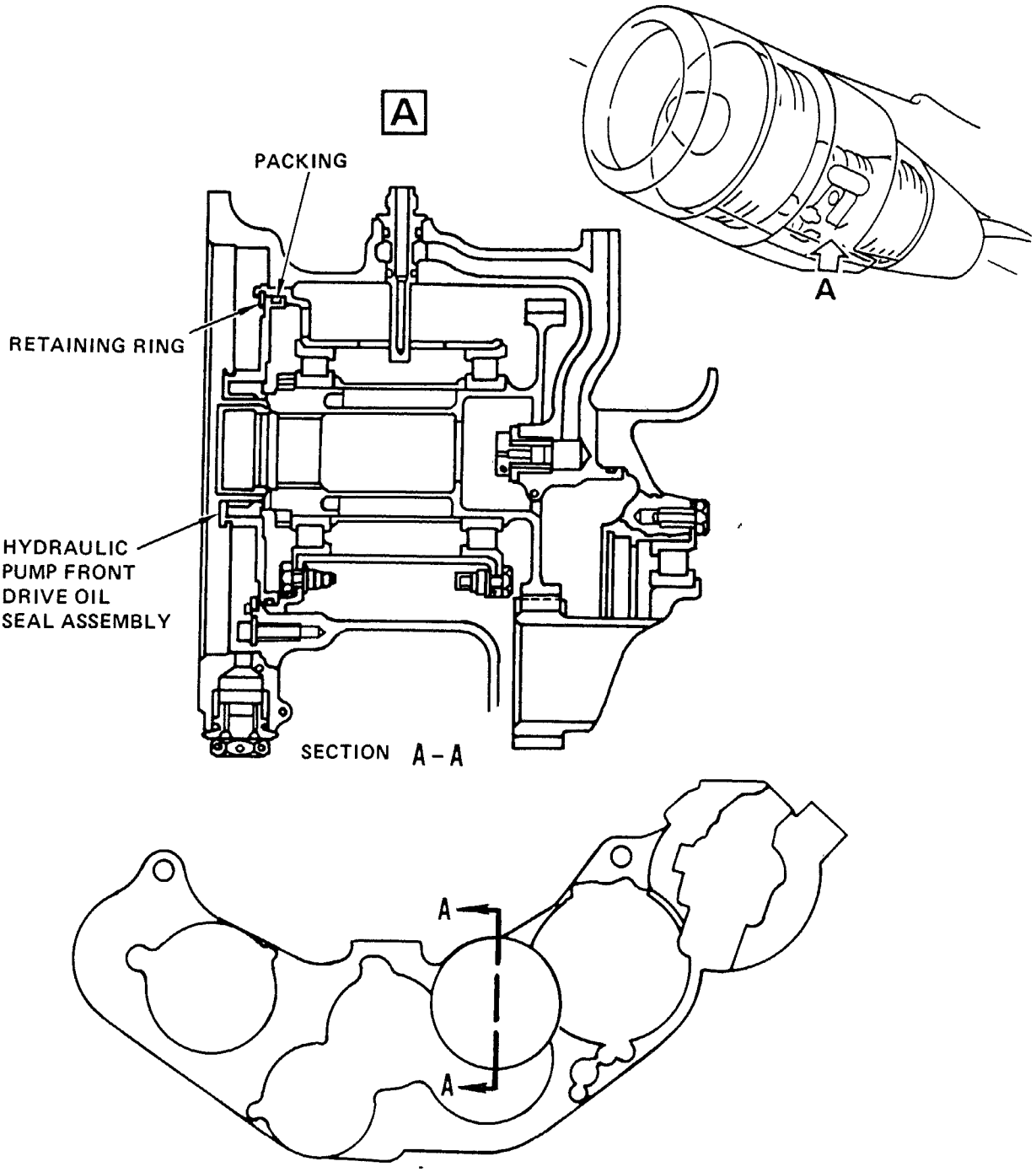
A. Job Set-Up
  (1)Open, safety and tag the appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
  (2)Remove front hydraulic pump (Ref. 29-11-32, P. Block 401).

B. Removal (Ref. Fig. 401)
  (1)Remove retaining ring securing hydraulic pump drive oil seal housing.
  (2)Install either PWA 88110 or PWA 85204 Puller to oil seal housing and secure.
    (a)Engage puller jaws with groove of seal housing.
    (b)Slide down puller ring until jaws are secured into groove.
  (3)Remove oil seal housing using slide hammer action of puller to overcome resistance of preformed packing.
    Remove puller. Discard packing.
  (4)Install protective closure.

C. Installation (Ref. Fig. 401)
  (1)Remove protective closure.
  (2)Lubricate new preformed packing with Material No.P03-001, and position in groove of hydraulic pump drive oil seal housing assembly.
  (3)Lubricate contact (carbon) surface of face seal assembly with Material No.P03-001.
  (4)Install oil seal and housing assembly into fuel hydraulic drive pad located over end of gearshaft to seat against shoulder of gearshaft.
  (5)Secure seal assembly with retaining ring.

D. Close-Up
  (1)Install front hydraulic pump (Ref. 29-11-32, P. Block 401).
  (2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
  (3)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).

(4)Test engine per test reference table (Ref. 71-00-00, P. Block 501).



Hydraulic Pump Front Drive Oil Seal Assembly
Figure 401

STARTER DRIVE COUPLING - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B. PWA26377	Holder
C. PWA85502	Puller
D. Material No.P03-001	Oils (Ref. 70-00-00)
E. Material No.P06-059	Lubricants (Ref. 70-00-00)
F.	Torque Wrench
Referenced Procedures	
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 80-13-01, P. Block 401	Pneumatic Starter

2. Procedure

A. Job Set-Up
(1)Open, safety and tag appropriate circuit breakers and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).
(2)Remove pneumatic starter assembly (Ref. 80-13-01, P. Block 401).

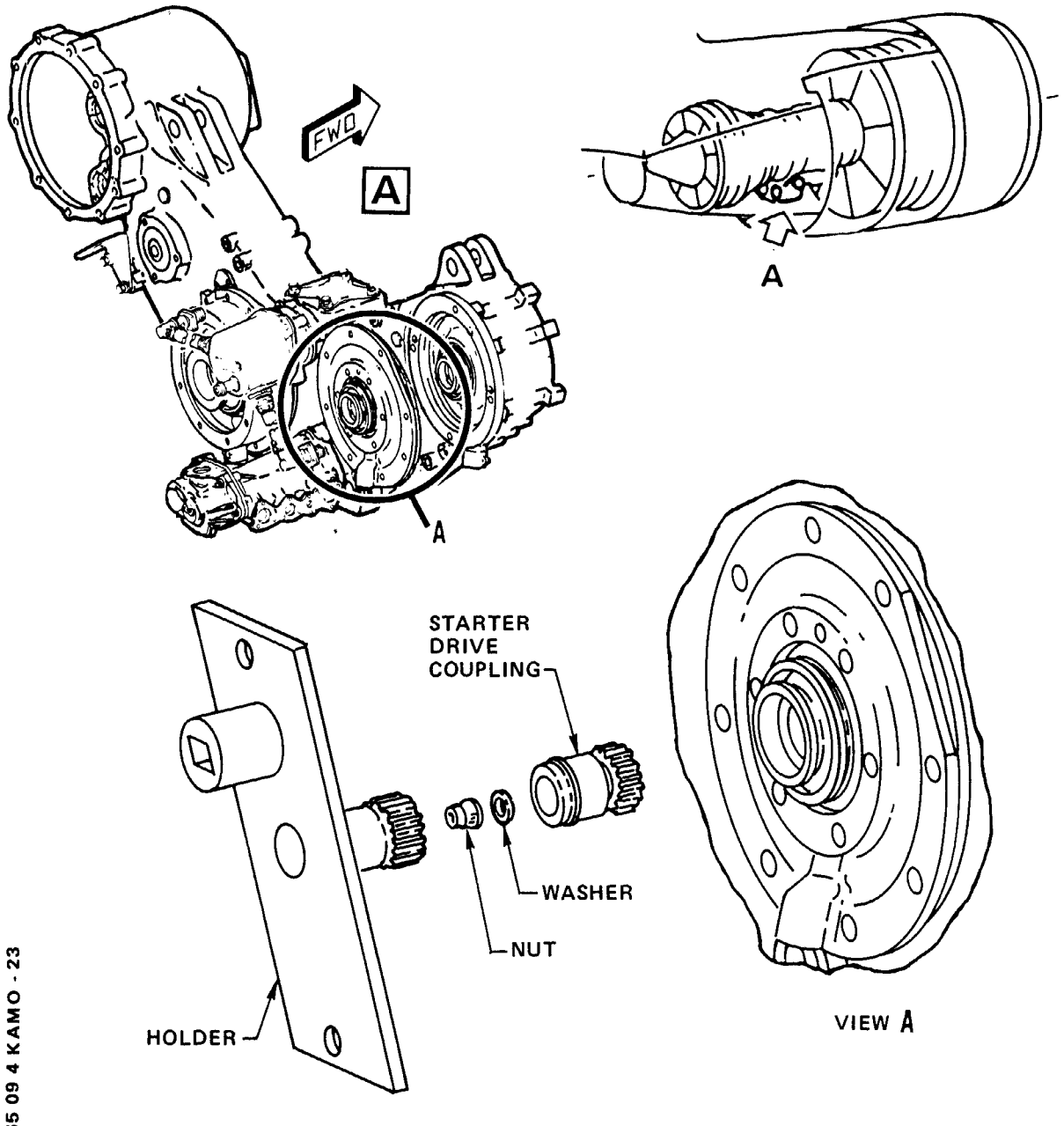
B. Removal (Ref. Fig. 401)
(1)Install splined drive of PWA26377 Holder into starter drive coupling and secure bar with two bolts to starter drive mount pad.
(2)Using standard wrench, reach through holder and remove nut which retains starter drive coupling.
(3)Remove holder from gearbox.
(4)Using PWA85502 Puller in puller hole in rear ID of coupling (behind splines), remove coupling with steady pull on handle of puller tool. Remove coupling from tool and remove flat washer from coupling ID.

C. Installation (Ref. Fig. 401)
CAUTION : BEFORE YOU APPLY FLUORINATED GREASE LUBRICANT (MATERIAL No.P06-059) TO THE STARTER DRIVE COUPLING, MAKE SURE THE STARTER DRIVE COUPLING SPLINES AND STARTER DRIVE GEARSHAFT SPLINES ARE CLEAN AND NOT DAMAGED. APPLY FLUORINATED GREASE LUBRICANT (MATERIAL No.P06-059) TO THE STARTER DRIVE COUPLING SPLINES TO REDUCE WEAR AND INCREASE SERVICE LIFE OF THE PARTS.
(1)Apply Fluorinated Grease Lubricant (Material No.P06-059) to the ID and OD splines of the starter drive coupling.
(2)Carefully insert coupling into gearbox drive gearshaft through opening in oil seal assembly aligning splines of coupling and gearshaft.
(3)Lubricate threads of nut with Engine Oil (Material No.P03-001). Secure coupling in place with flat washer and locknut, fingertight.
(4)Install splined drive of PWA26377 Holder into starter drive coupling and secure bar with two bolts to starter drive mount pad.
(5)Using standard wrench, reach through holder and TORQUE retaining nut to between 290 and 325 lbf. in. (3.28 - 3.67 m.daN).

(6)Remove holder from starter drive mount pad.

D. Close-Up

(1)Install pneumatic starter assembly (Ref. 80-13-01, P. Block 401).
(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(3)Close thrust reverser and fan cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).
(4)Test engine per test reference table (Ref. 71-00-00, P. Block 501).



Replacement of Starter Drive Coupling
Figure 401

MAIN OIL FILTER HOUSING - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Circuit Breaker Safety Clips
B.	Container 5 US Gallons (19 liters)
C.	Filter Element
D.	Packing
E.	Retainer
F.	Bergen Mechanical Crimper (Optional) Model M303, M305 or M307
G. Material No.P03-001	Oils (Ref. 70-00-00)
H. Material No.P03-003	Oils (Ref. 70-00-00)
I. Material No.P05-289	Special Materials (Ref. 70-00-00)
J. Material No.P05-291	Special Materials (Ref. 70-00-00)
K. Material No.P05-292	Special Materials (Ref. 70-00-00)
L. Material No.P06-003	Lubricants (Ref. 70-00-00)
Referenced Procedures	
- 12-13-79, P. Block 1	Engine Oil System
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors

2. Procedure

A. Job Set-Up
(1)Open, safety and tag the appropriate circuit breakers and open left thrust reverser door (Ref. 71-13-00, P. Block 301).
(2)Remove oil pressure switch tube assemblies.

B. Removal
(1)Drain the oil from the main oil filter housing assembly (called MOFH) (1) as follows : (Ref. Fig. 401) (Sheet 1).
(a)Prepare to catch the oil in a 5 gallon (19 l) container.
(b)Remove the plug from the cover assembly (2).

1 Hold the insert with a wrench while you remove the plug. Remove the plug.
2 Discard the packing.

(2)Disconnect the air/oil cooler inlet tube assembly (LP02) as follows : (Ref. Fig. 401) (Sheet 1).
(a)Remove the three bolts that attach the assembly to the "oil-out" hole on top of the MOFH.
(b)Discard the packing.

Pre SB PW4ENG 79-75
(3)Remove the main filter oil tube assembly (LP01) as follows : (Ref. Fig. 401) (Sheets 2 and 3).
(a)Remove the three bolts that attach the assembly to the "oil-in" hole on the front of the MOFH.
(b)Remove the two bolts that attach the assembly and a bracket to the

top of the lubrication and scavenge oil pump.
(c)Remove the bolts and nuts that attach clamps at five locations.
(d)Remove the assembly.
(e)Discard the packings.

Post SB PW4ENG 79-75

(4)Remove the main oil filter hose and tube assembly (LP01) and, if applicable, the fluid pressure dampener or (Post SB PW4ENG 79-86) adapter as follows (Ref. Fig. 406, 407) :
(a)Remove bolts securing tube to front of main oil filter housing.
(b)Remove the bolts that hold the tube to the top of the fluid pressure dampener or adapter.
(c)Remove bolt, nut and clamp securing tube to diffuser case bracket at approximately 7 o'clock position.
(d)Remove bolts, nuts and clamps securing tube to gearbox brackets and remove tube from engine.
(e)If applicable, remove the bolts that hold the fluid pressure dampener or adapter to the top of the main oil pump.
(f)If applicable, remove the loop clamp bracket from the dampener or adapter.
(g)If applicable, remove the dampener or adapter from the engine.
(h)Discard packings from the hose and tube assembly and the filter.

End SB PW4ENG 79-75

(5)Remove the oil cooler bypass valve drain tube assembly (LP20) as follows : (Ref. Fig. 401) (Sheet 4).
(a)Remove the bolts that attach the tube to the "servo" hole on the MOFH.
(b)Disconnect the upper end of the tube at the fuel/oil cooler bypass valve.
(c)Remove the tube.
(d)Discard the packings and retainer.
(6)Disconnect the oil trim pressure tube assembly (LP32) as follows : (Ref. Fig. 401) (Sheet 4).
(a)Remove the clamp bolt that attaches the tube to the bracket in back of the fuel/oil cooler.
(b)Remove the bolts that attach the assembly to the "trim" hole on the MOFH.
(c)Disconnect the assembly from the MOFH.
(d)Discard the packing.
(7)Disconnect the W3 and W5 wiring harnesses as follows : (Ref. Fig. 401) (Sheet 4).
(a)Remove the bolt and nut that attach the wiring harness clamp to the bracket on the MOFH.
(8)Remove the MOFH (1) as follows : (Ref. Fig. 401) (Sheet 1).
(a)Remove the bolts and washers that attach the MOFH to the front of the gearbox.
(b)Remove the MOFH.
(9)Remove the transfer tubes and, if applicable, the anti-siphon tube assembly (Ref. Fig. 401) (Sheet 5).
(a)Remove the transfer tubes and, if applicable, the anti-siphon tube assembly from the holes in the front of the gearbox. MOFHs that are pre SB PW4 ENG 79-43, have three transfert tubes. MOFHs that are

post SB PW4 ENG 79-43 have two transfer tubes and an anti-siphon tube assembly.

(b)Discard the packings.

Pre SB PW4ENG 72-524

(10)If applicable, remove the details from the MOFH as follows. (Ref. Fig. 402)(Sheets 1 and 2)

(a)Remove the pressure relief valve (filter element) (19) from port in main oil filter housing (3) located just above pressure (regulator) relief valve pad (16). Discard packings (17) and (18).

(b)Remove inserts (1) from ports in face of main oil filter housing. Discard packings (2).

(c)Remove the plug (12), and insert (10) from the bottom port in main oil strainer cover (15). Discard packings (9) and (11).

(d)Remove four bolts (13) and washers (14) securing main oil strainer cover (15) to main oil filter housing (3). Remove cover and filter element (4) from housing. Remove filter element. Discard packing (8).

(e)Remove spring (5) from cover. Remove screw (6) securing key washer (7) to cover. Remove key washer and discard.

(f)Remove the oil system pressure relief valve (16) as follows.

1 Remove the bolts that attach the bracket and valve to th MOFH.
2 Remove the bracket and valve.
3 Discard the packings.

Post SB PW4ENG 72-524 and Pre SB PW4ENG 79-79

(11)If applicable, remove the details from the MOFH as follows. (Ref. Fig. 404) (Sheets 1 and 2)

(a)Remove the pressure relief valve (filter element) (19) from port in main oil filter housing (3) located just above pressure (regulator) relief valve pad (16). Discard packings (17) and (18).

(b)Remove inserts (1) from ports in face of main oil filter housing. Discard packings (2).

(c)Remove the plug (12), and the insert (10) from bottom port in main oil strainer cover (15). Discard packings (9) and (11).

(d)Remove the four nuts (29) or (30) and the washers (14) that secure the main oil strainer cover (15) to main oil filter housing (3). Remove cover and filter element (4) from housing. Remove filter element. Discard packing (8).

(e)Remove spring (5) from cover. Remove screw (6) securing key washer (7) to cover. Remove key washer and discard.

(f)Remove the oil system pressure relief valve (16) as follows.

1 Remove the bolts that attach the bracket and valve to the MOFH.
2 Remove the bracket and valve.
3 Discard the packings.

Post SB PW4ENG 72-524 and Post SB PW4ENG 79-79

(12)If applicable, remove the details from the MOFH as follows. (Ref. Fig. 405) (Sheets 1 and 2)

(a)Remove the pressure relief valve (filter element) (19) from the port in the main oil filter housing (3) located just above the pressure (regulator) relief valve pad (16). Discard the packings (17) and (18).

(b)Remove the inserts (1) from ports in face of the main oil filter

housing.
Discard the packings (2).
(c)Remove the plug (12), and the insert (10) from the bottom port in the main oil strainer cover (21). Discard the packings (9) and (11).
(d)Remove the four nuts (29) or (30) and the washers (14) that secure the main oil strainer cover (21) to the main oil filter housing (3). Remove the cover and the filter element (4) from the housing. Remove the filter element. Discard the packing (8).
(e)Remove the spring (5) from the cover (21). Remove the two screws (22) and the two washers (20) securing the spring retainer (23) to the cover (21).
(f)Remove the oil system pressure relief valve (16) as follows.

1 Remove the bolts that attach the bracket and valve to the MOFH.
2 Remove the bracket and valve.
3 Discard the packings.

End of SB PW4ENG 72-524 and SB PW4ENG 79-79

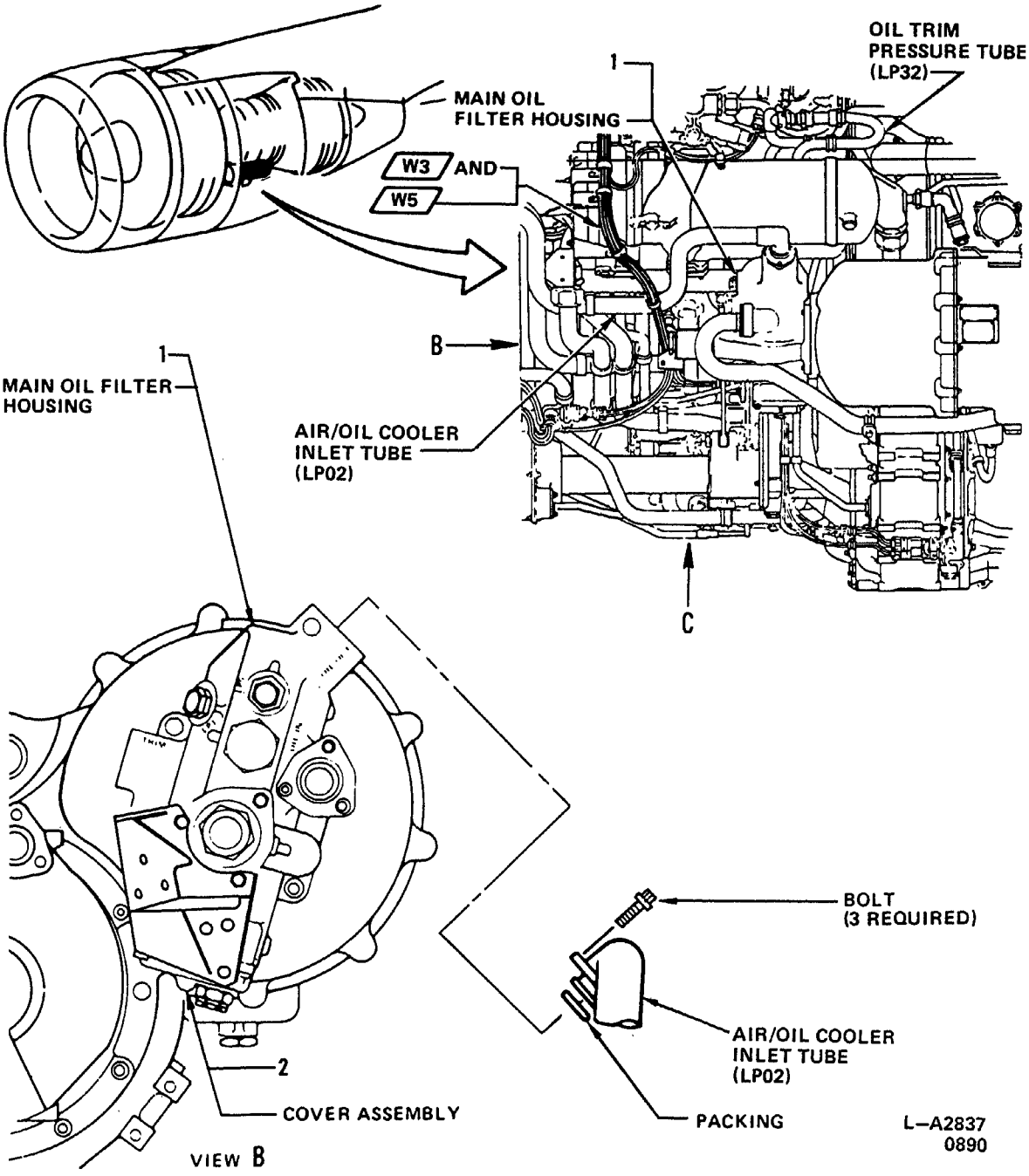
R **ON A/C 101-104,

R Post SB 72-2030 For A/C 101-104,

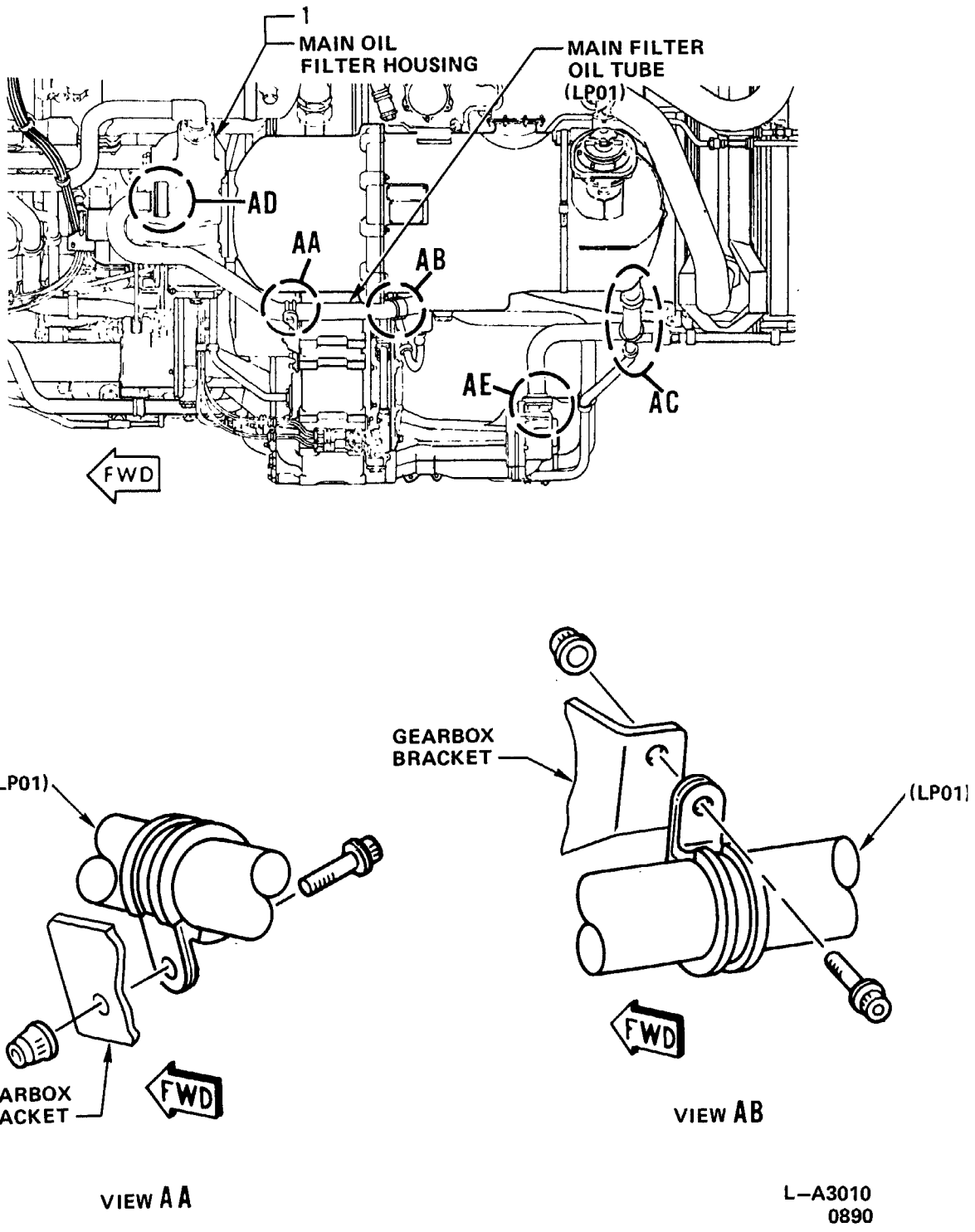
(10)If applicable, remove the details from the MOFH as follows. (Ref. Fig. 403)(Sheets 1 and 2)
(a)Remove the plug (43) from port in main oil filter housing (3) located just above pressure (regulator) relief valve pad (16). Discard packings (17) and (18).
(b)Remove inserts (1) from ports in face of main oil filter housing. Discard packings (2).
(c)Remove the plug (12), from the bottom port in main oil strainer cover (42). Discard packing (11).
(d)Remove four nuts (29) and washers (14) securing main oil strainer cover (42) to main oil filter housing (3). Remove cover and filter element (39) from housing. Remove filter element. Discard packing (8).
(e)Remove retaining ring (40) from pressure relief valve (41) and remove pressure relief valve from cover (42).
CAUTION : PRESSURE RELIEF VALVE IS SPRING LOADED. EXERCISE CARE WHEN REMOVING.
(f)Remove the oil system pressure relief valve (16) as follows.

1 Remove the bolts that attach the bracket and valve to the MOFH.
2 Remove the bracket and valve.
3 Discard the packings.

**ON A/C 101-200,

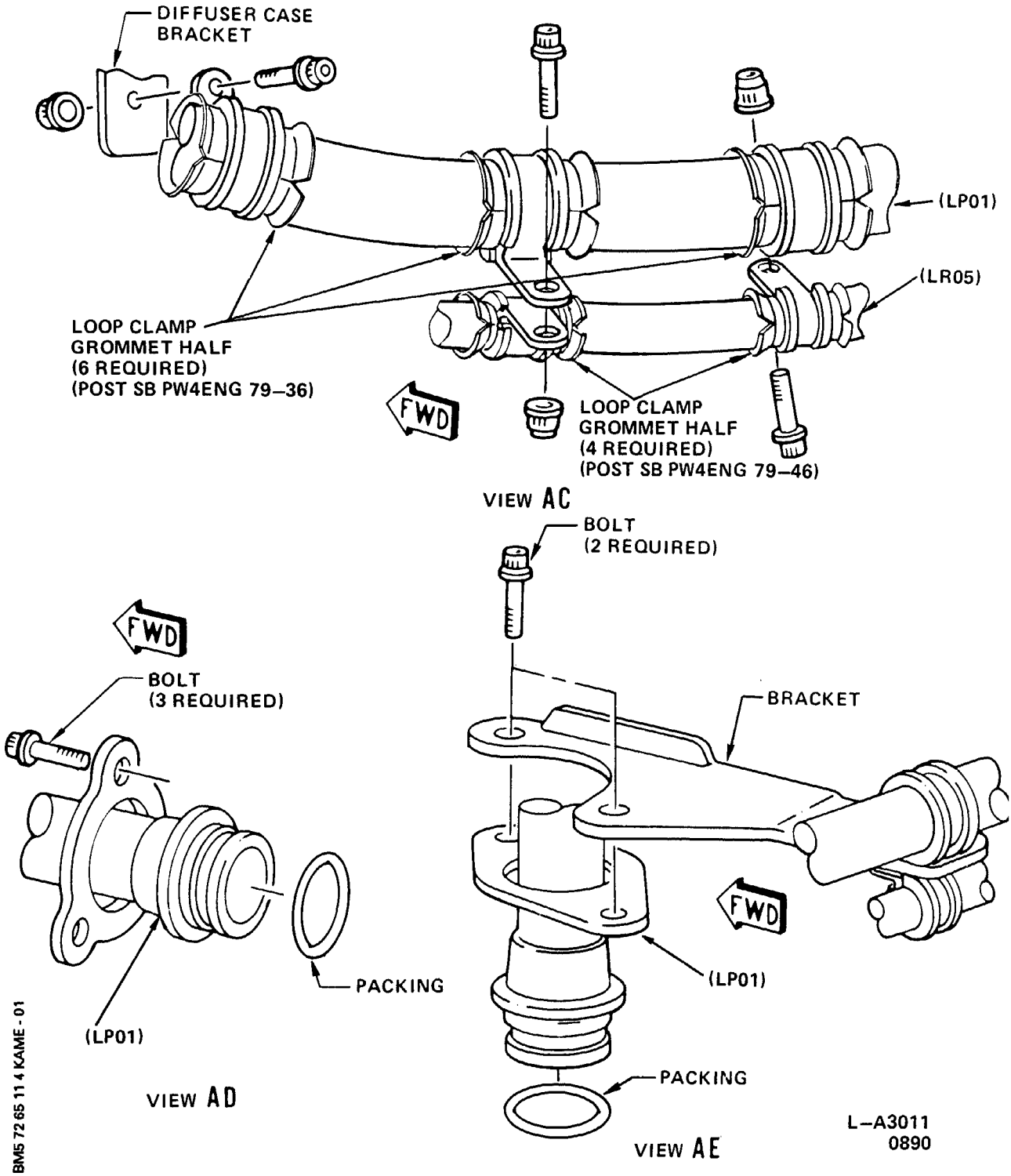


Main Oil Filter Housing - (Sheet 1)
Figure 401

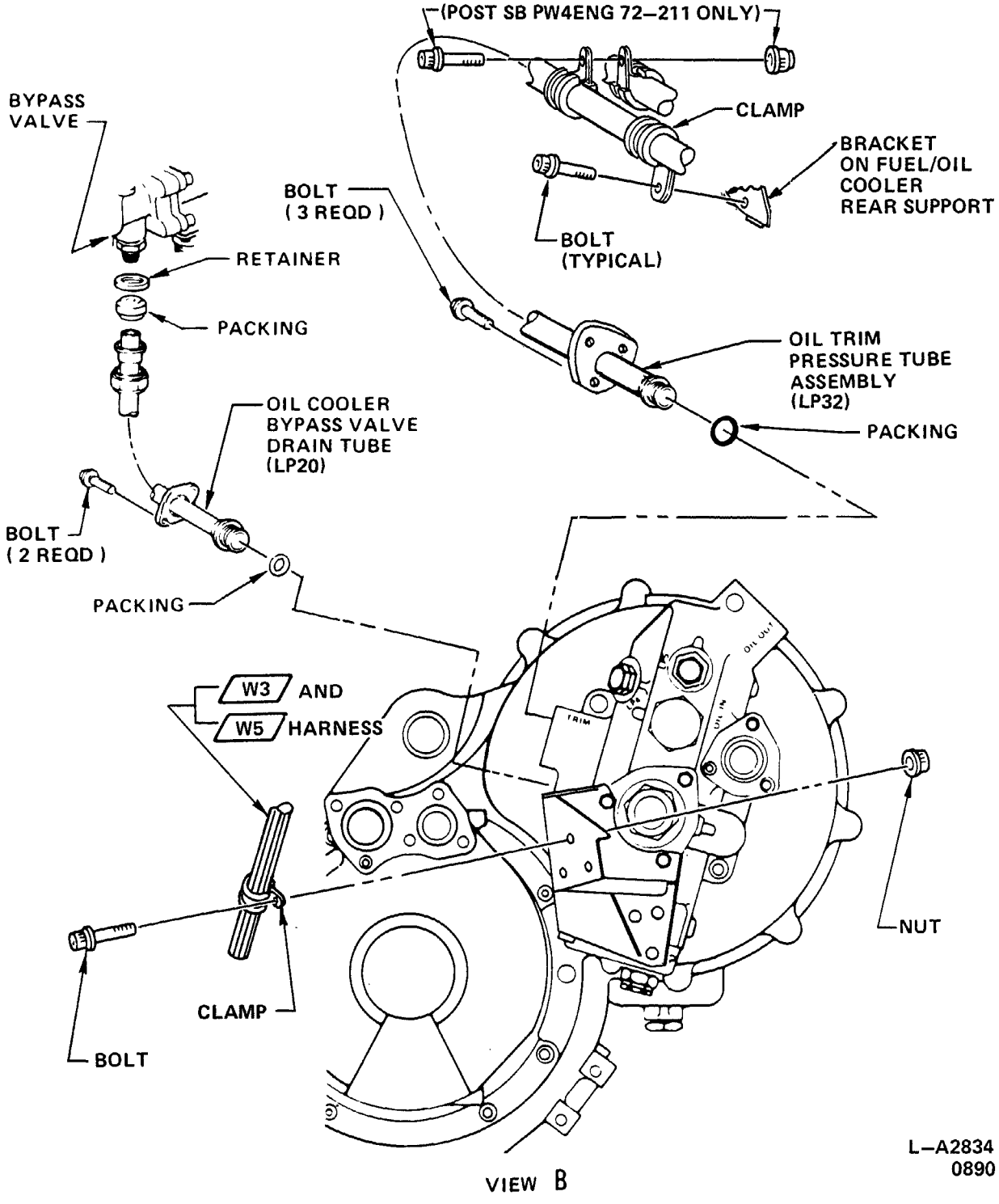


BM5 72 65 11 4 KAMC - 01

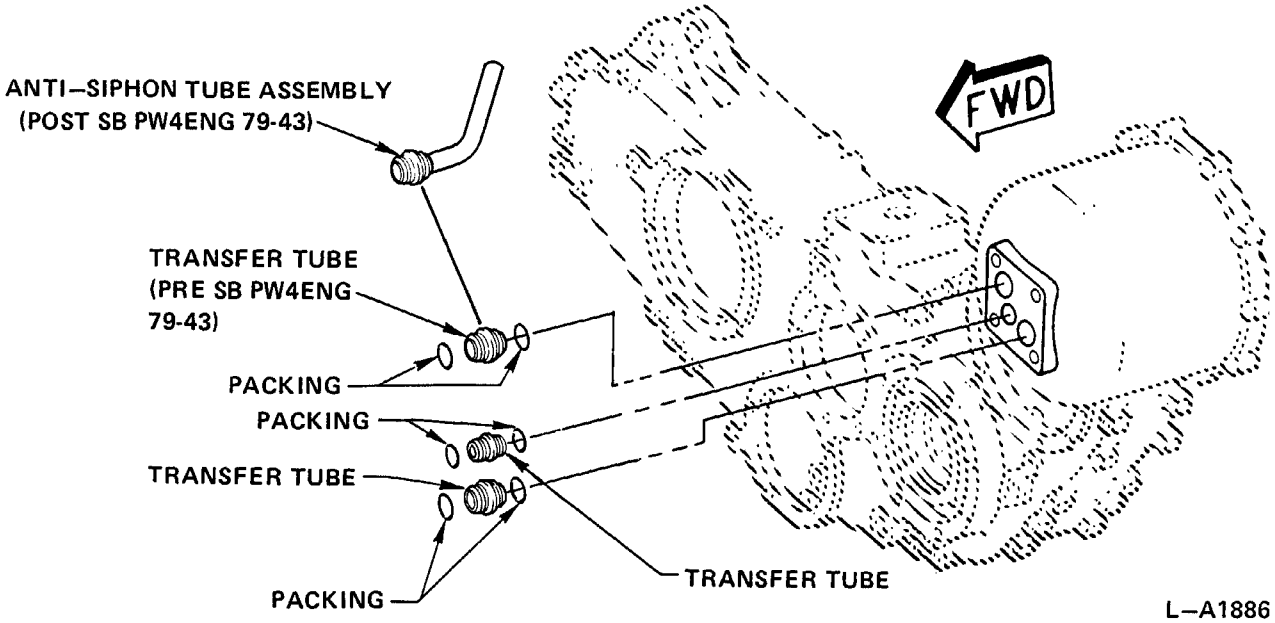
Main Oil Filter Housing - (Sheet 2)
Figure 401



Main Oil Filter Housing - (Sheet 3)
Figure 401

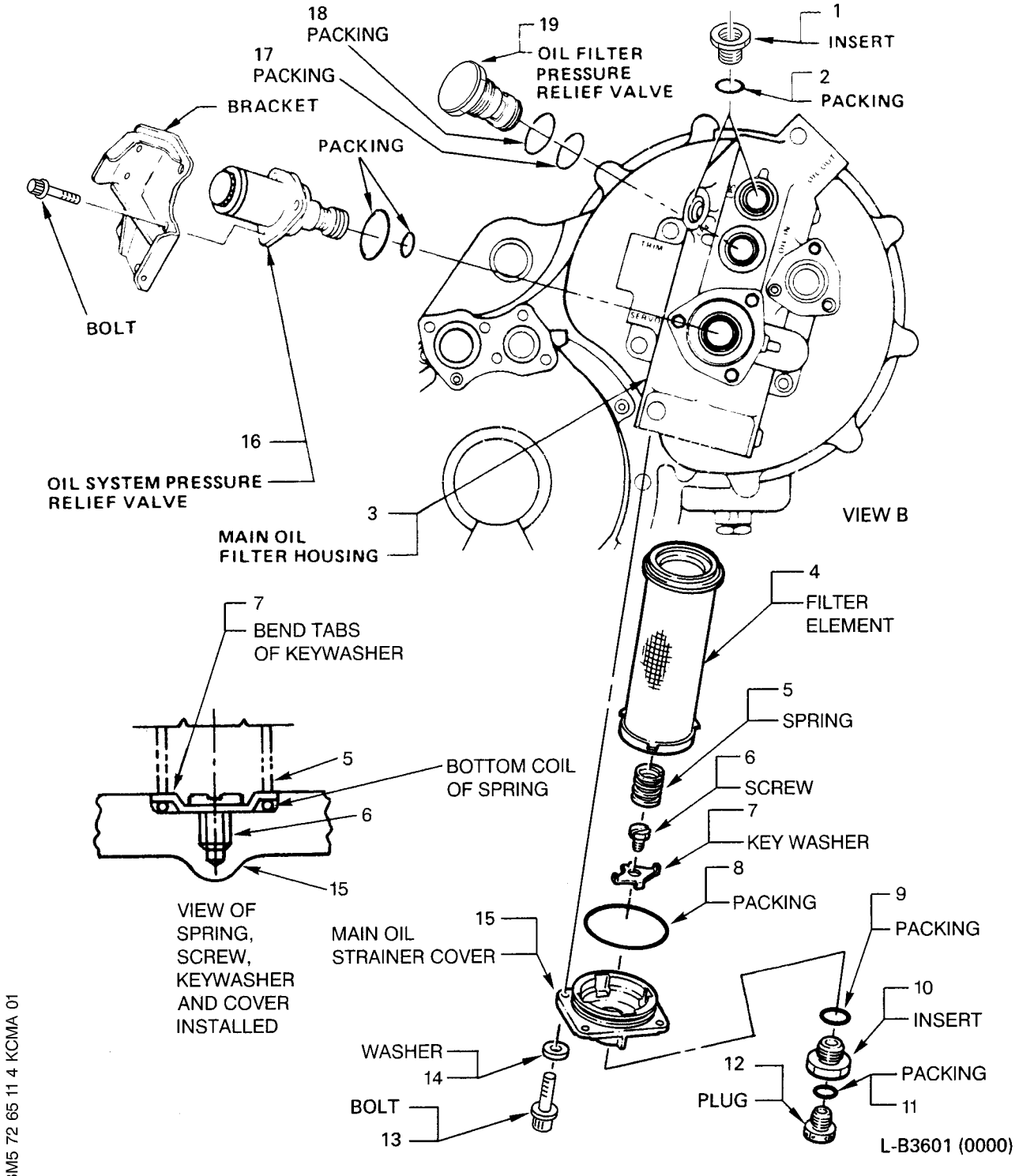


Main Oil Filter Housing - (Sheet 4)
Figure 401

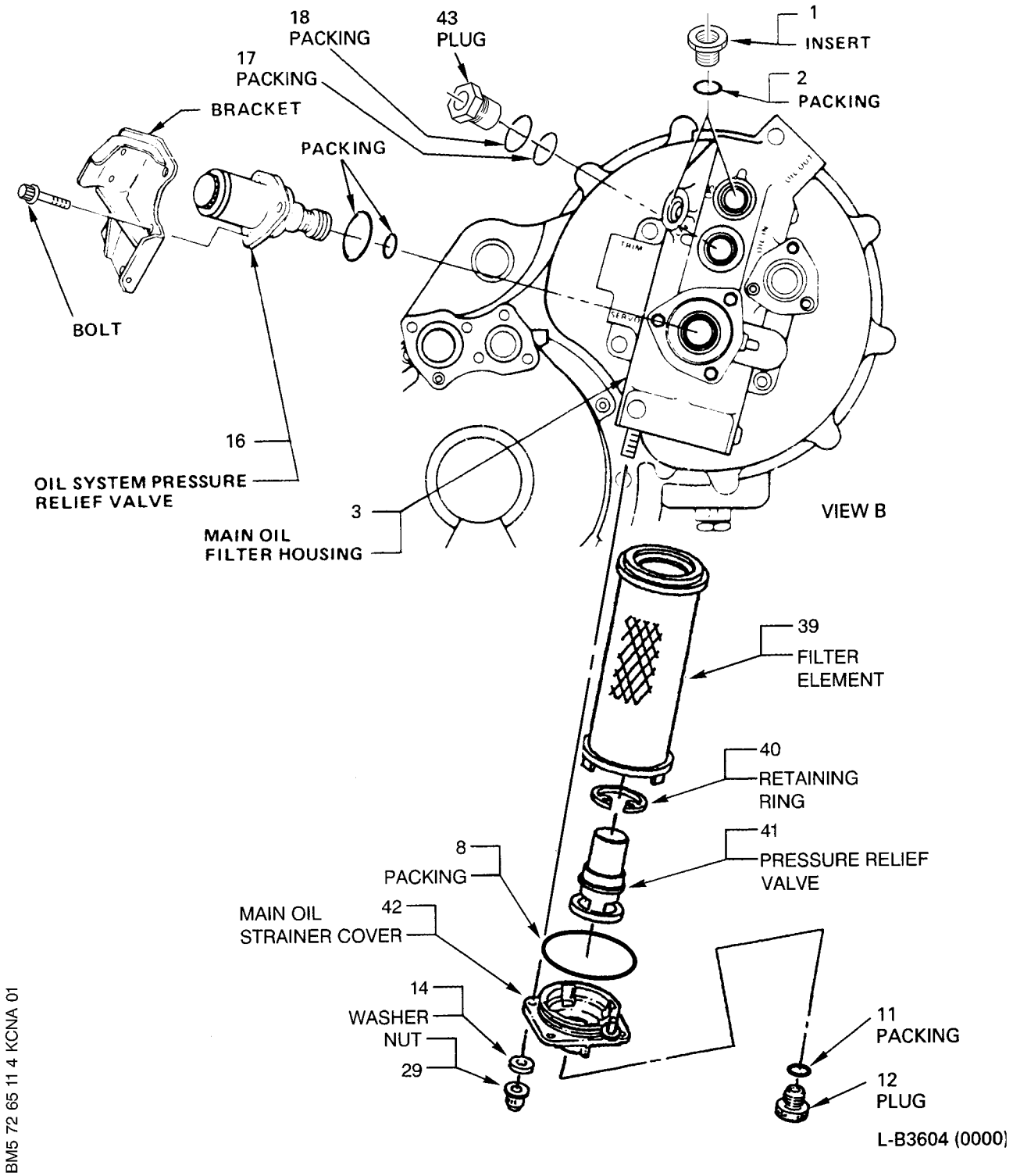


BM5 72 65 11 4 KAMJ - 01

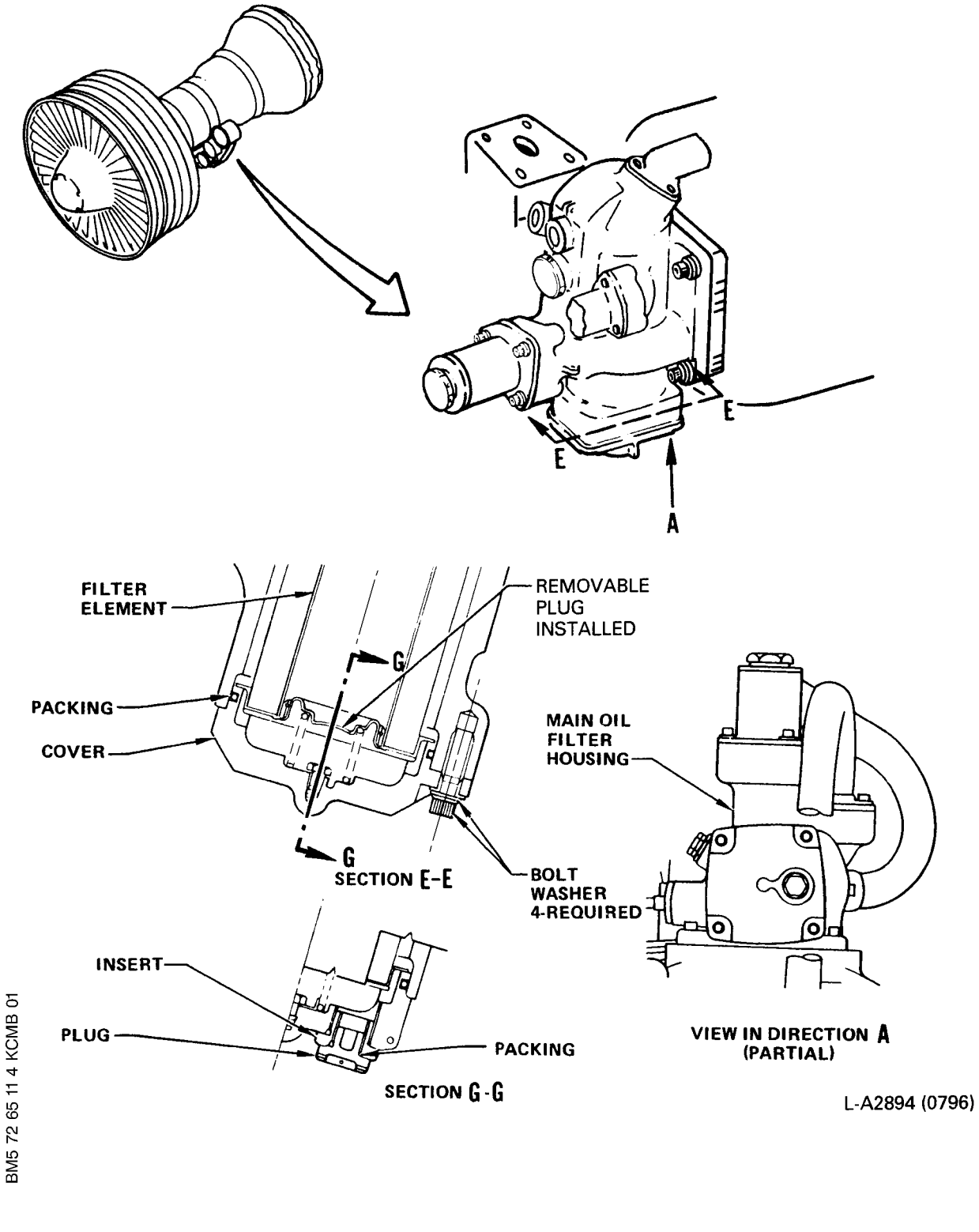
Main Oil Filter Housing - (Sheet 5)
Figure 401



Main Oil Filter Housing (Pre SB PW4ENG 72-524) - (Sheet 1)
Figure 402

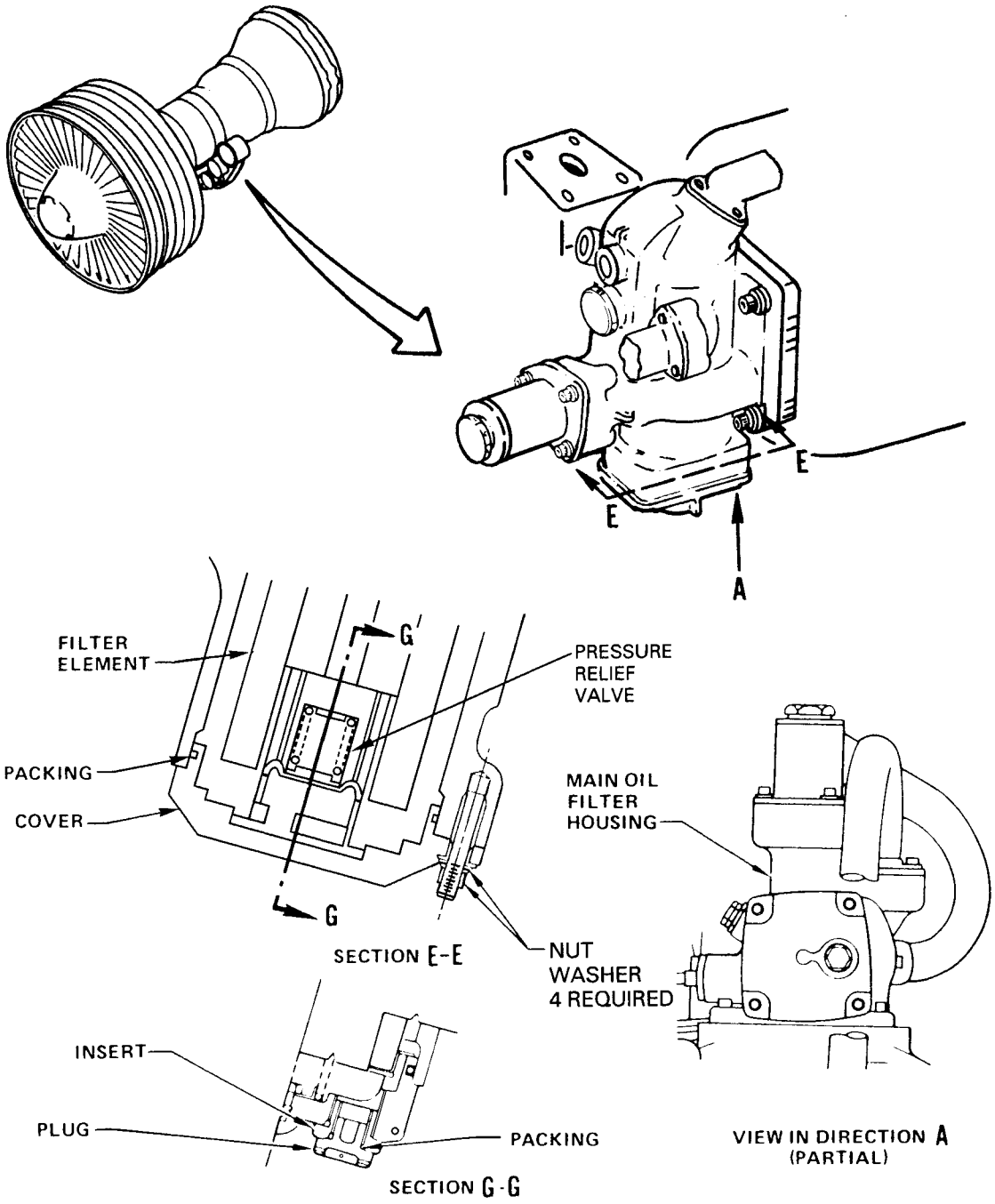


Main Oil Filter Housing - (Sheet 1)
Figure 403



BM5 72 65 11 4 KCMB 01

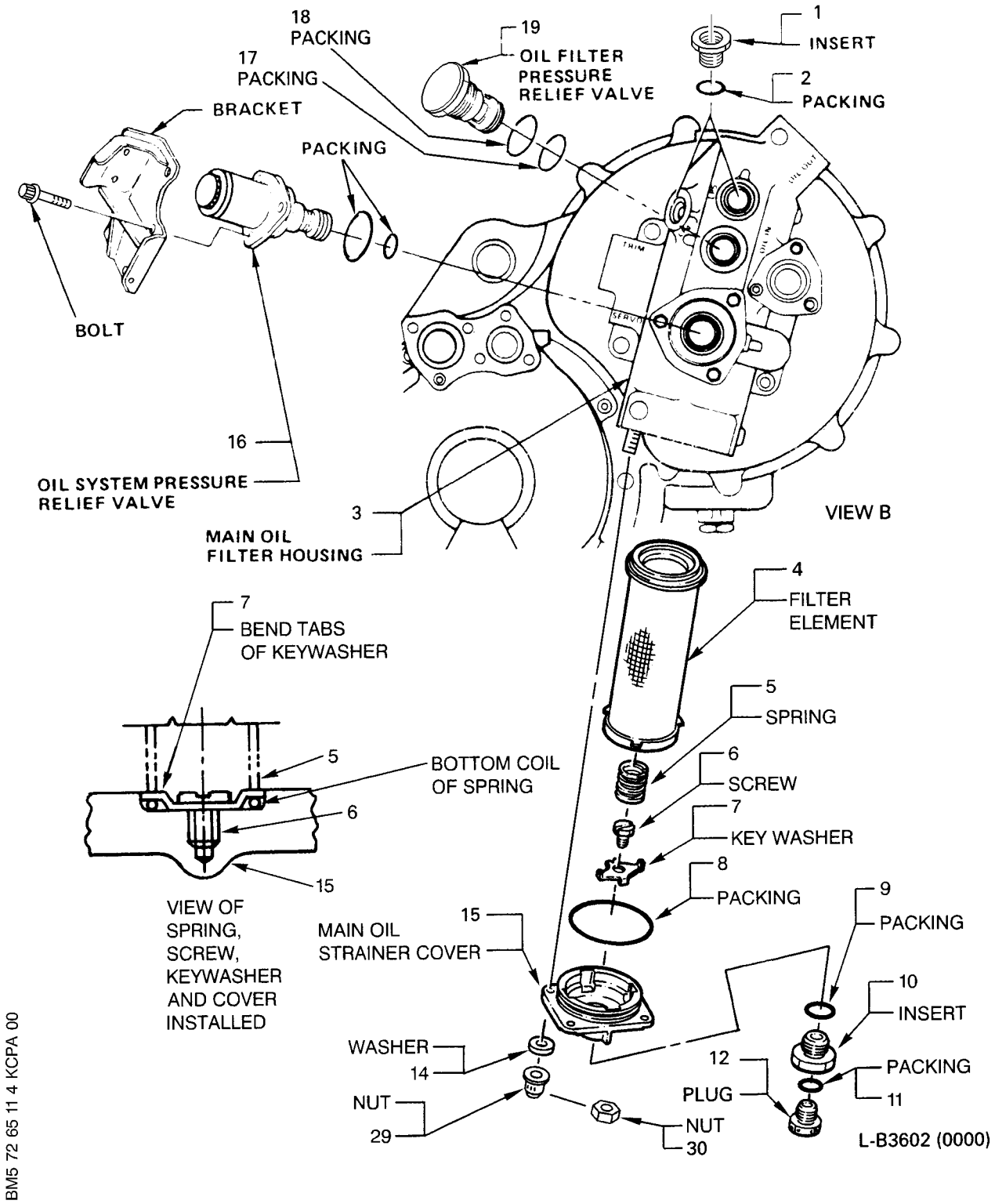
Main Oil Filter Housing (Pre SB PW4ENG 72-524) - (Sheet 2)
Figure 402



L-B0927 (0796)

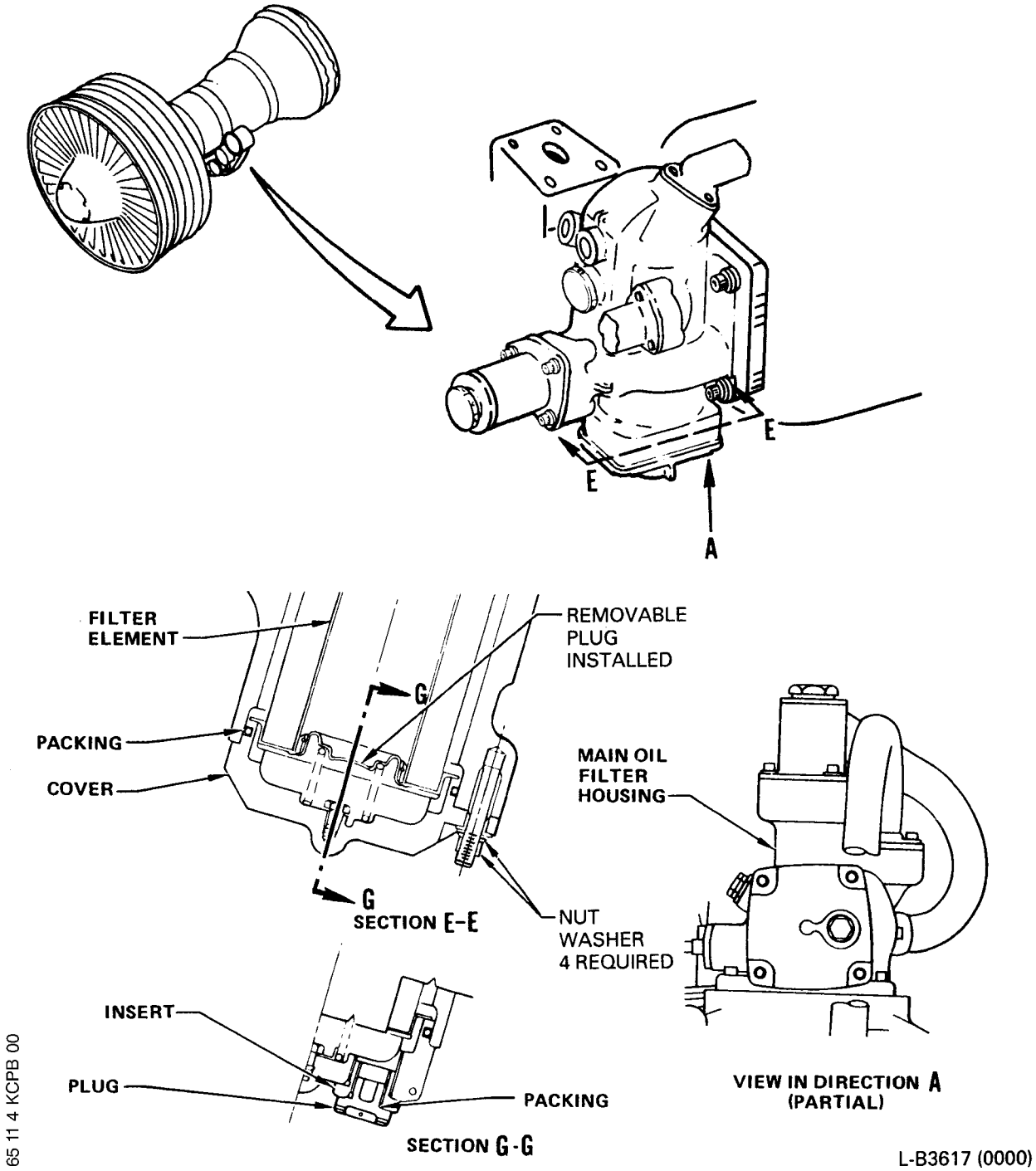
BM5 72 65 11 4 KCNB 01

Main Oil Filter Housing - (Sheet 2)
Figure 403



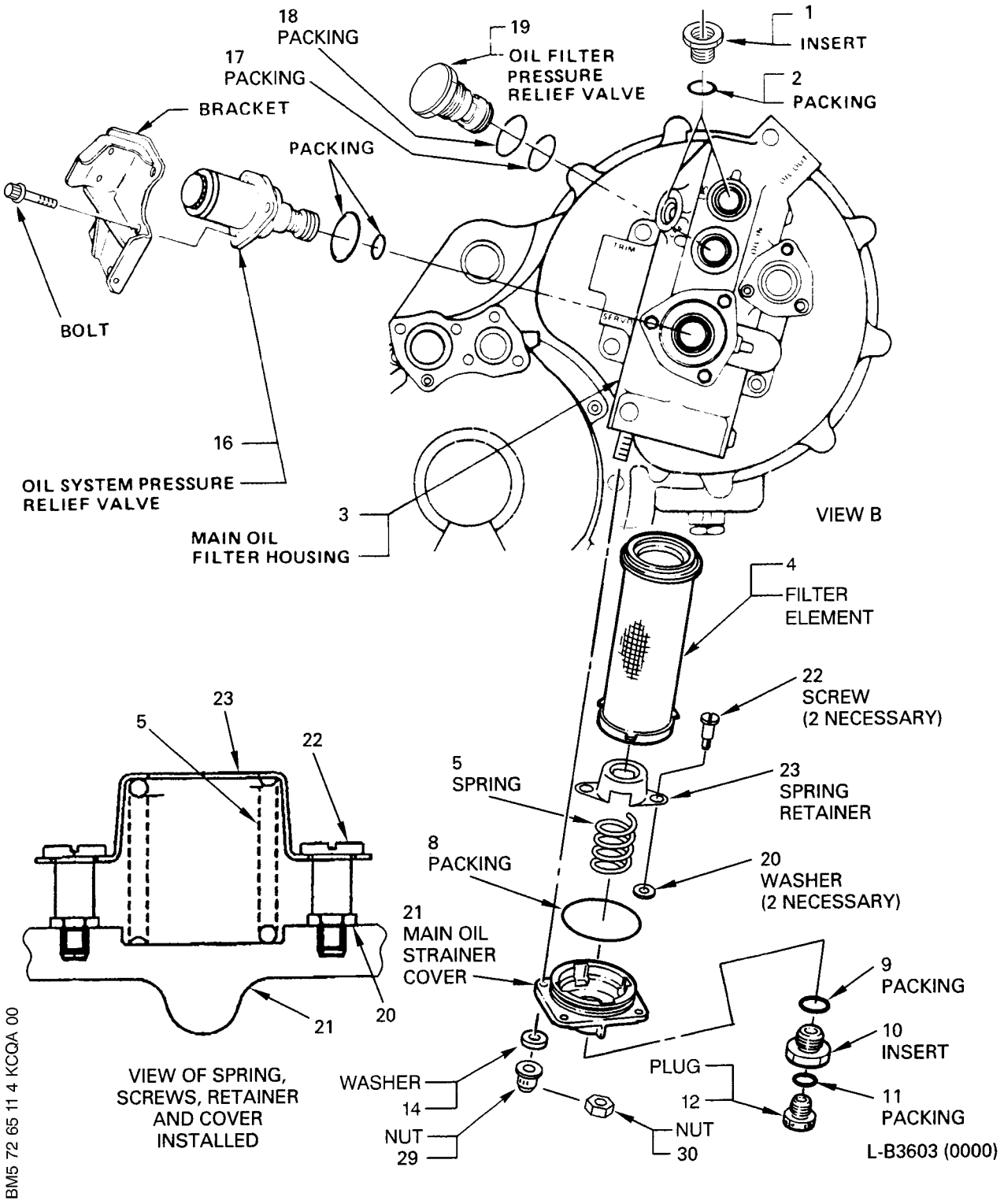
BM5 72 65 11 4 KCPA 00

Main Oil Filter Housing (Post SB PW4ENG 72-524)
(Pre SB PW4ENG 79-79) - (Sheet 1)
Figure 404

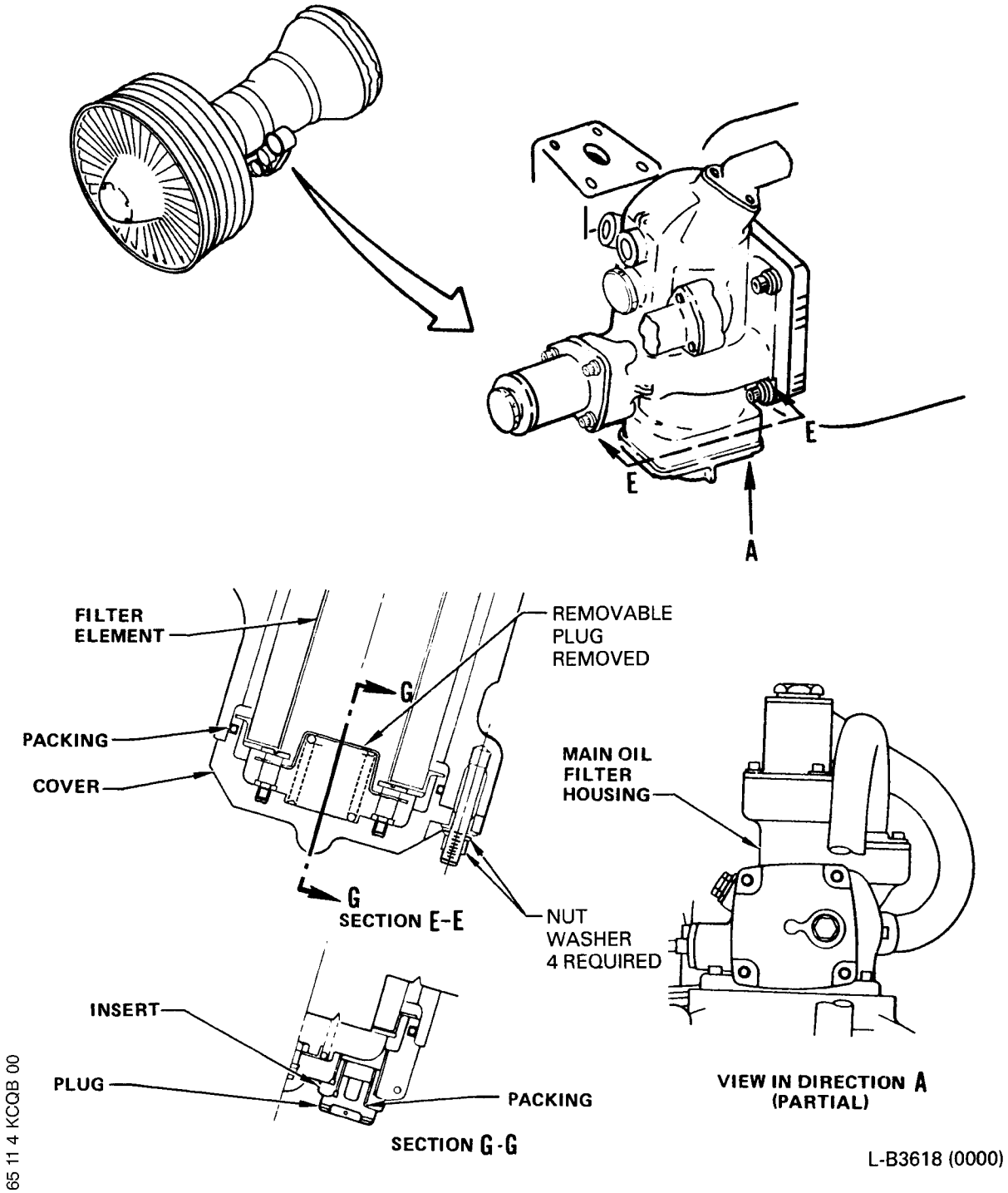


BM5 72 65 11 4 KCPB 00

Main Oil Filter Housing (Post SB PW4ENG 72-524)
(Pre SB PW4ENG 79-79) - (Sheet 2)
Figure 404

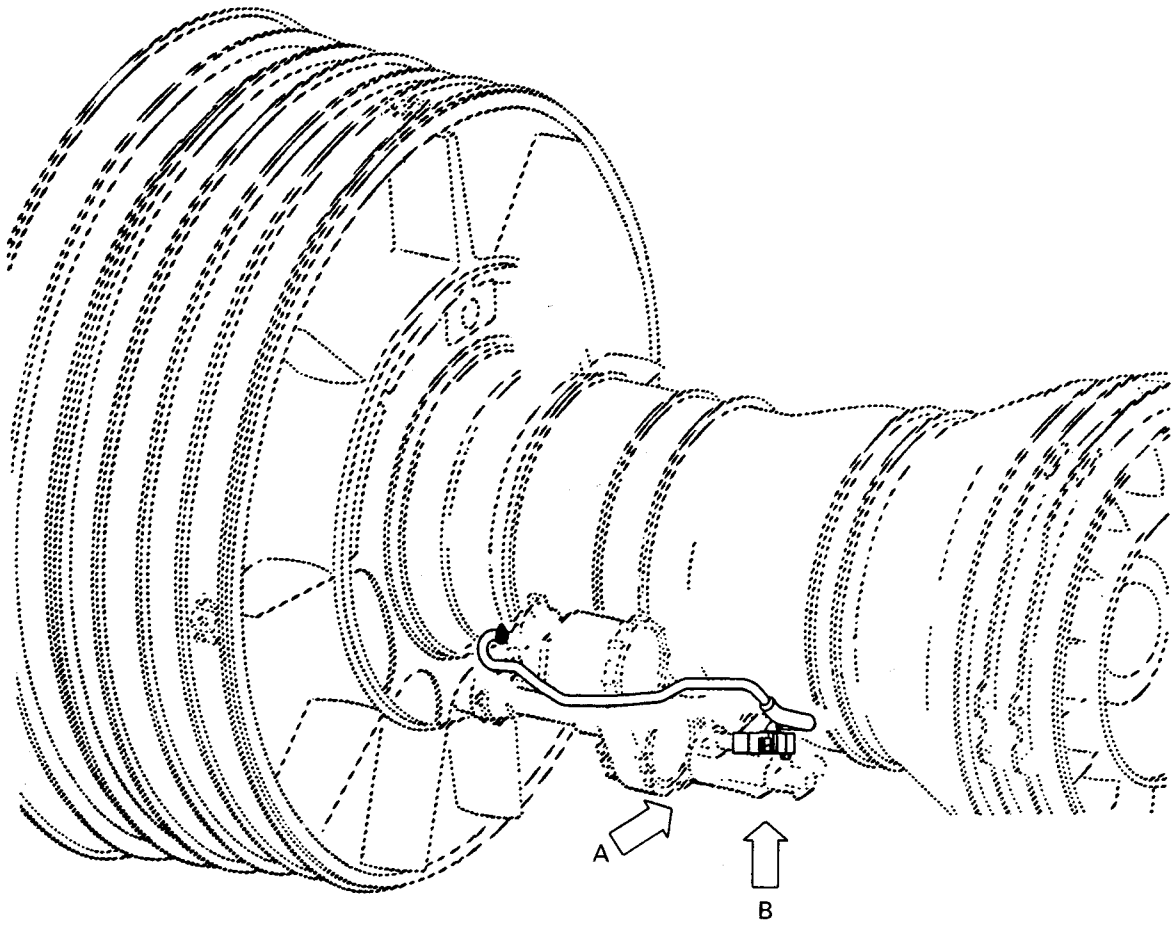


Main Oil Filter Housing (Post SB PW4ENG 72-524)
(Post SB PW4ENG 79-79) - (Sheet 1)
Figure 405



BM5 72 65 11 4 KCQB 00

Main Oil Filter Housing (Post SB PW4ENG 72-524)
(Post SB PW4ENG 79-79) - (Sheet 2)
Figure 405

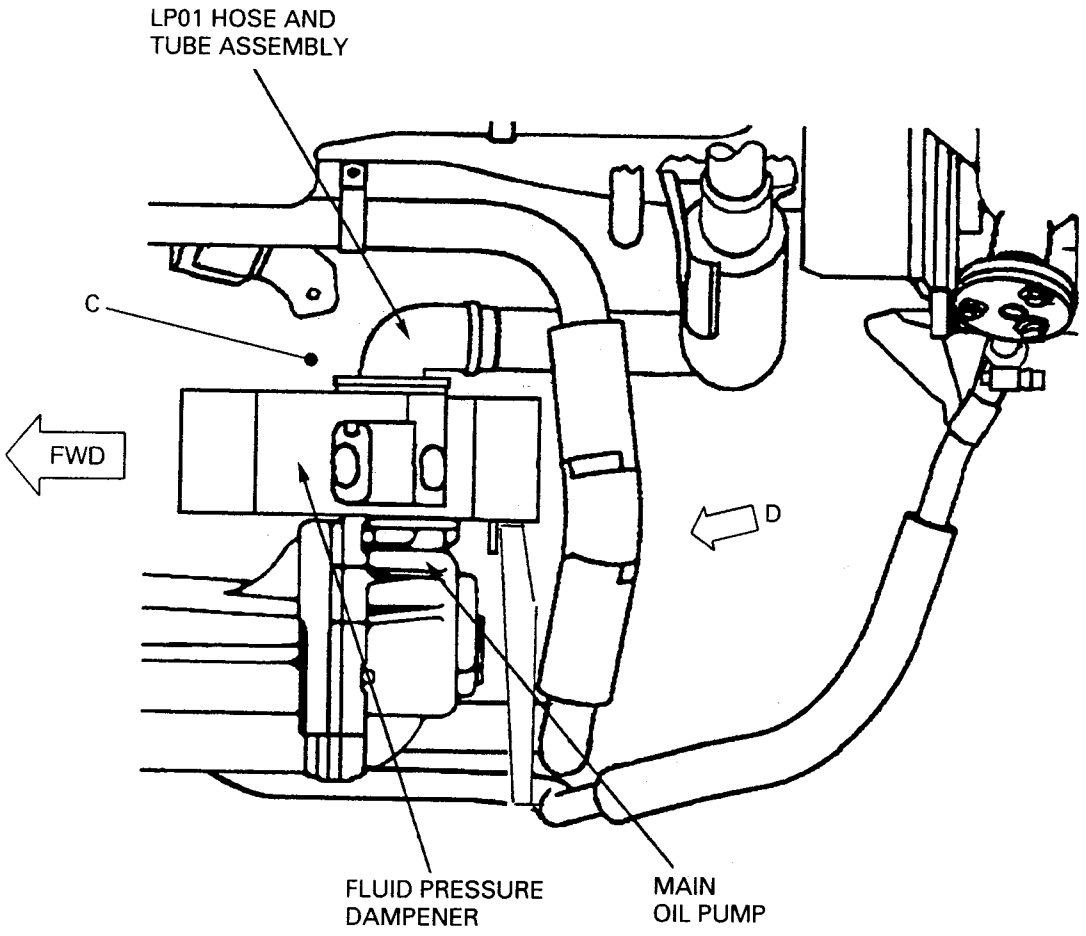


ENGINE LEFT SIDE VIEW

L-B2502 (0000)

BM5 72 65 11 4 KEMA 00

Main Filter Oil Tube (Post SB PW4ENG 79-75) (Sheet 1)
Figure 406

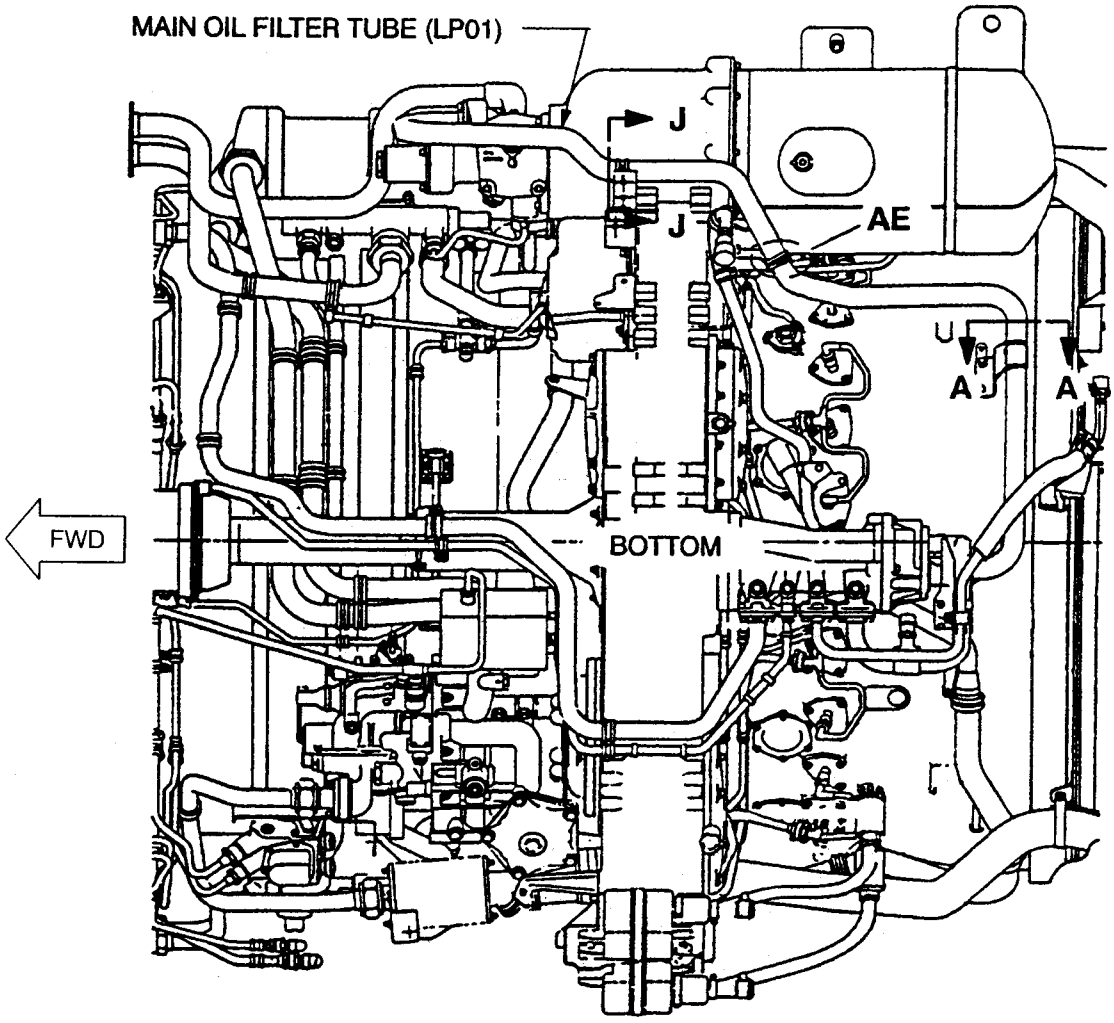


VIEW A

L-B2503 (0000)

BM5 72 65 11 4 KEMB 00

Main Filter Oil Tube (Post SB PW4ENG 79-75) (Sheet 2)
Figure 406

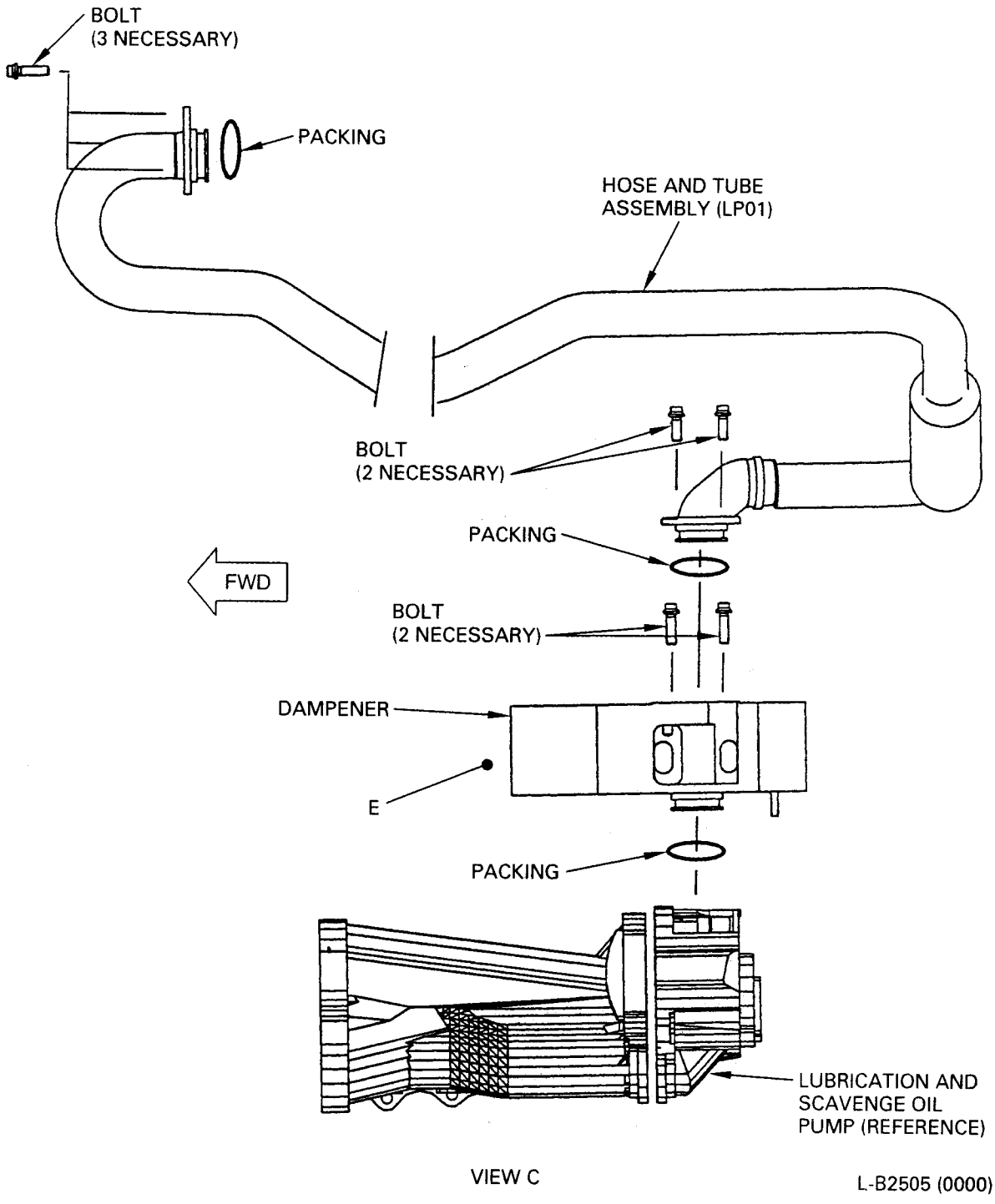


VIEW B
(ENGINE BOTTOM VIEW)

L-B2504 (0000)

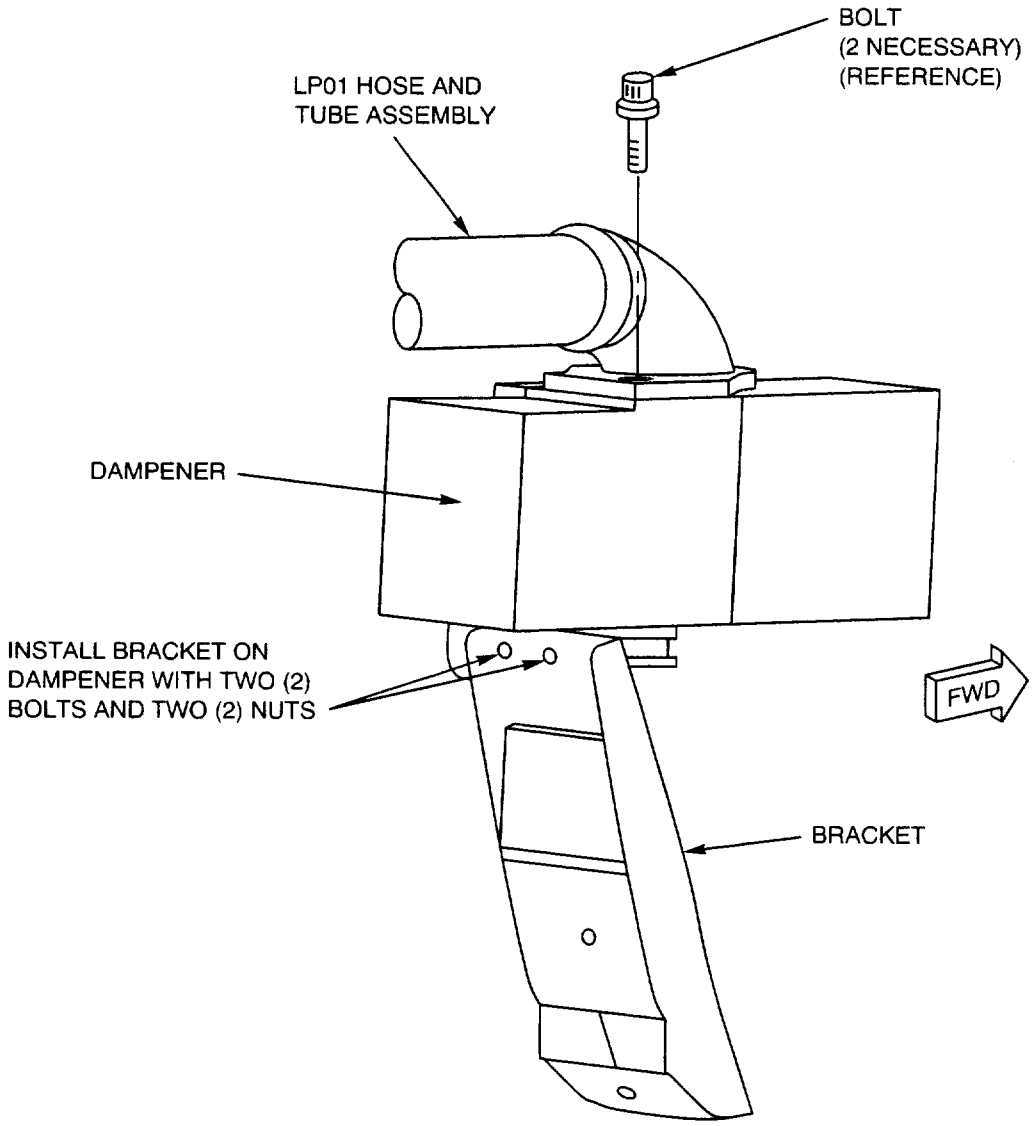
BM5 72 65 11 4 KEMC 00

Main Filter Oil Tube (Post SB PW4ENG 79-75) (Sheet 3)
Figure 406



BM5 72 65 11 4 KEMD 00

Main Filter Oil Tube (Post SB PW4ENG 79-75) (Sheet 4)
Figure 406

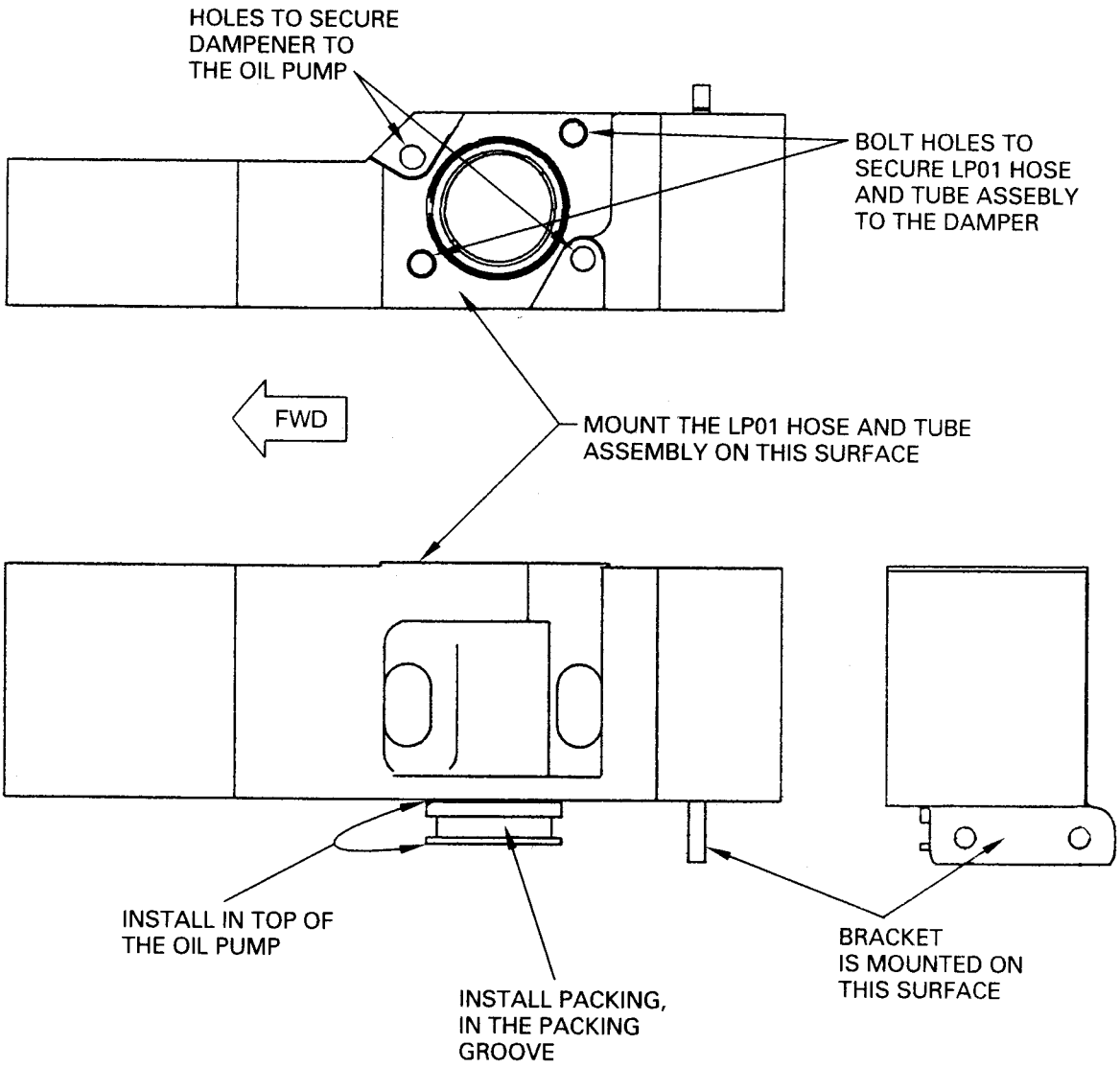


VIEW D
(SHOWS NEW CONFIGURATION
WITH OIL PUMP OMITTED)

L-B2506 (1297)
PW V

BM5 72 65 11 4 KEME 01

Main Filter Oil Tube (Post SB PW4ENG 79-75) (Sheet 5)
Figure 406

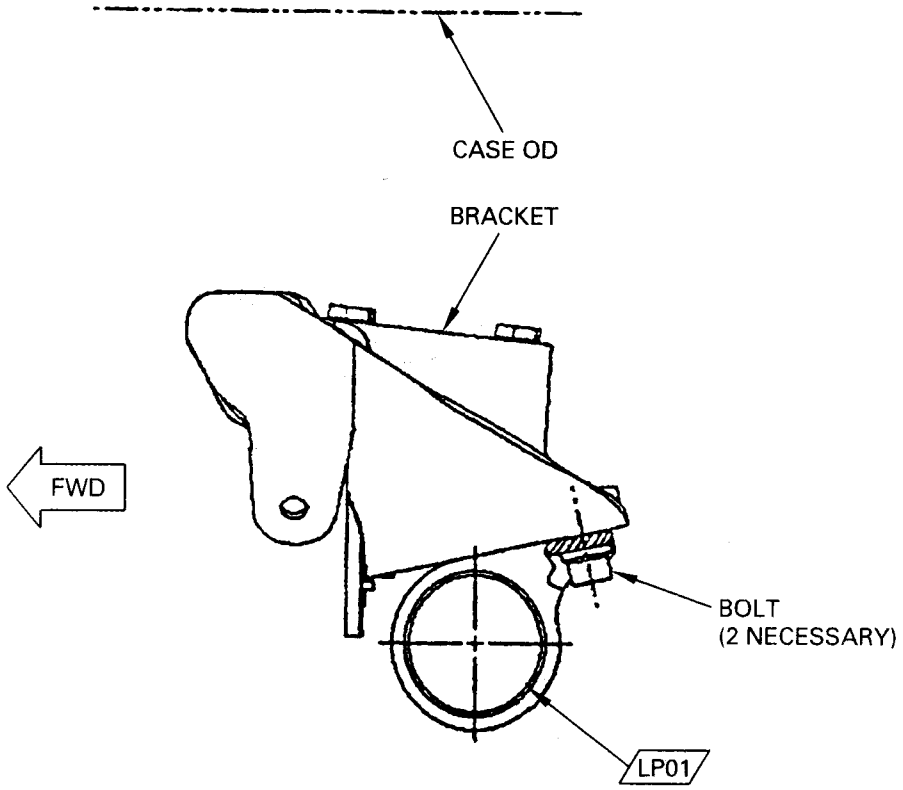

HOLES TO SECURE DAMPENER TO THE OIL PUMP
BOLT HOLES TO SECURE LP01 HOSE AND TUBE ASSEBLY TO THE DAMPER
FWD
MOUNT THE LP01 HOSE AND TUBE ASSEMBLY ON THIS SURFACE
INSTALL IN TOP OF THE OIL PUMP
INSTALL PACKING, IN THE PACKING GROOVE
BRACKET IS MOUNTED ON THIS SURFACE

VIEW E

L-B2507 (0000)

BM5 72 65 11 4 KEMF 00

Main Filter Oil Tube (Post SB PW4ENG 79-75) (Sheet 6)
Figure 406

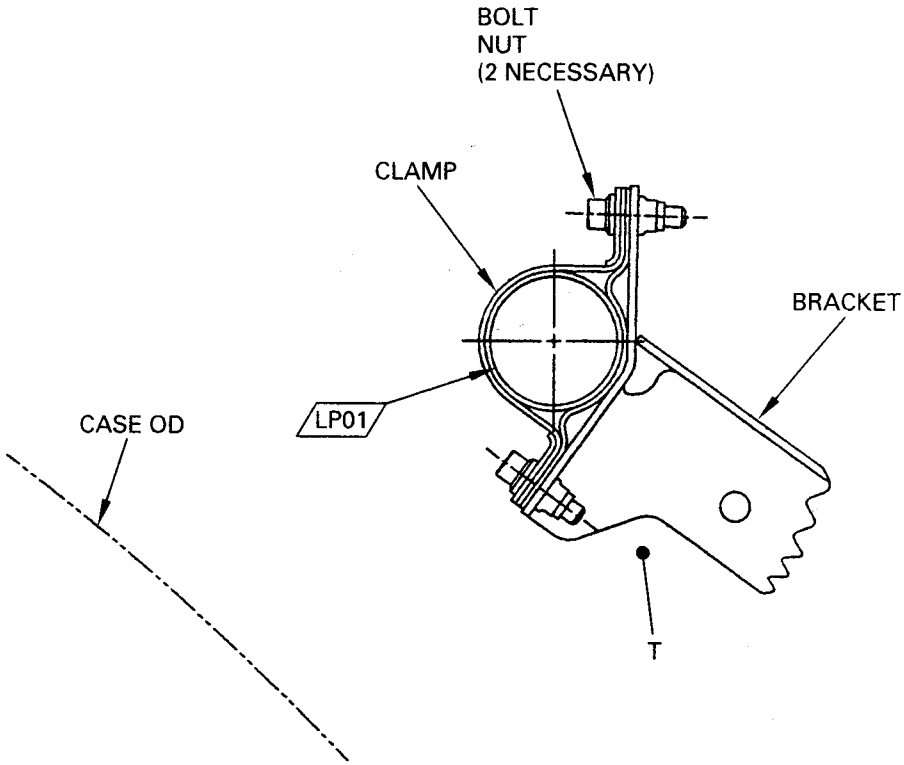


VIEW A-A

BM5 72 65 11 4 KEMG 00

L-B2509 (0000)

Main Filter Oil Tube (Post SB PW4ENG 79-75) (Sheet 7)
Figure 406

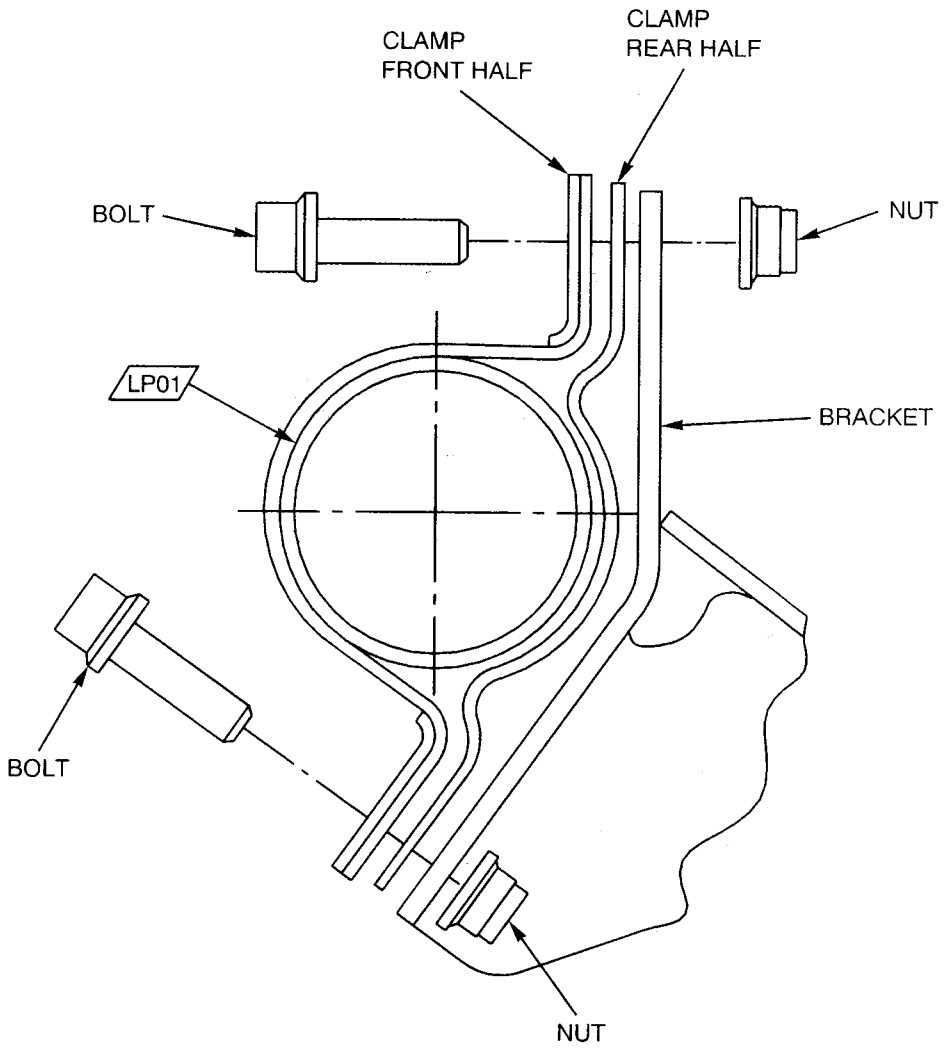


VIEW J-J

L-B2512 (0000)

BM5 72 65 11 4 KEMH 00

Main Filter Oil Tube (Post SB PW4ENG 79-75) (Sheet 8)
Figure 406

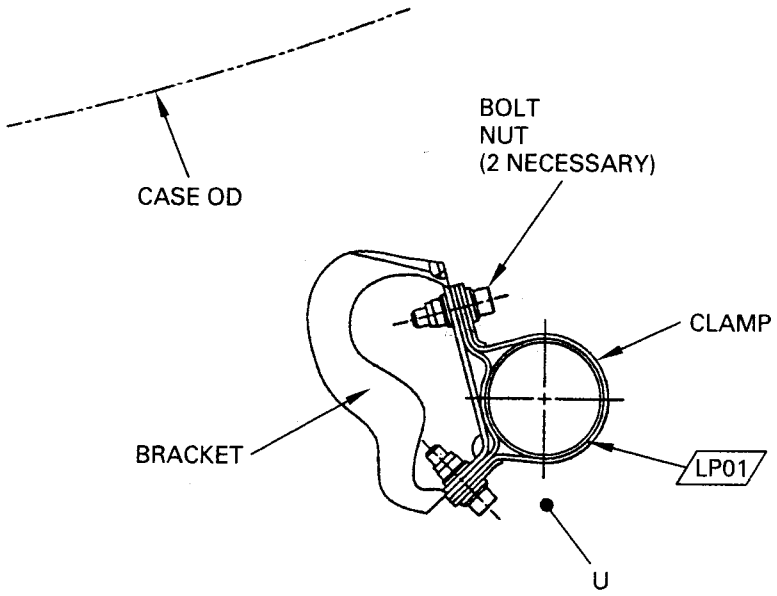


VIEW T

BM5 72 65 11 4 KEMJ 00

L-B2513 (000
PW

Main Filter Oil Tube (Post SB PW4ENG 79-75) (Sheet 9)
Figure 406

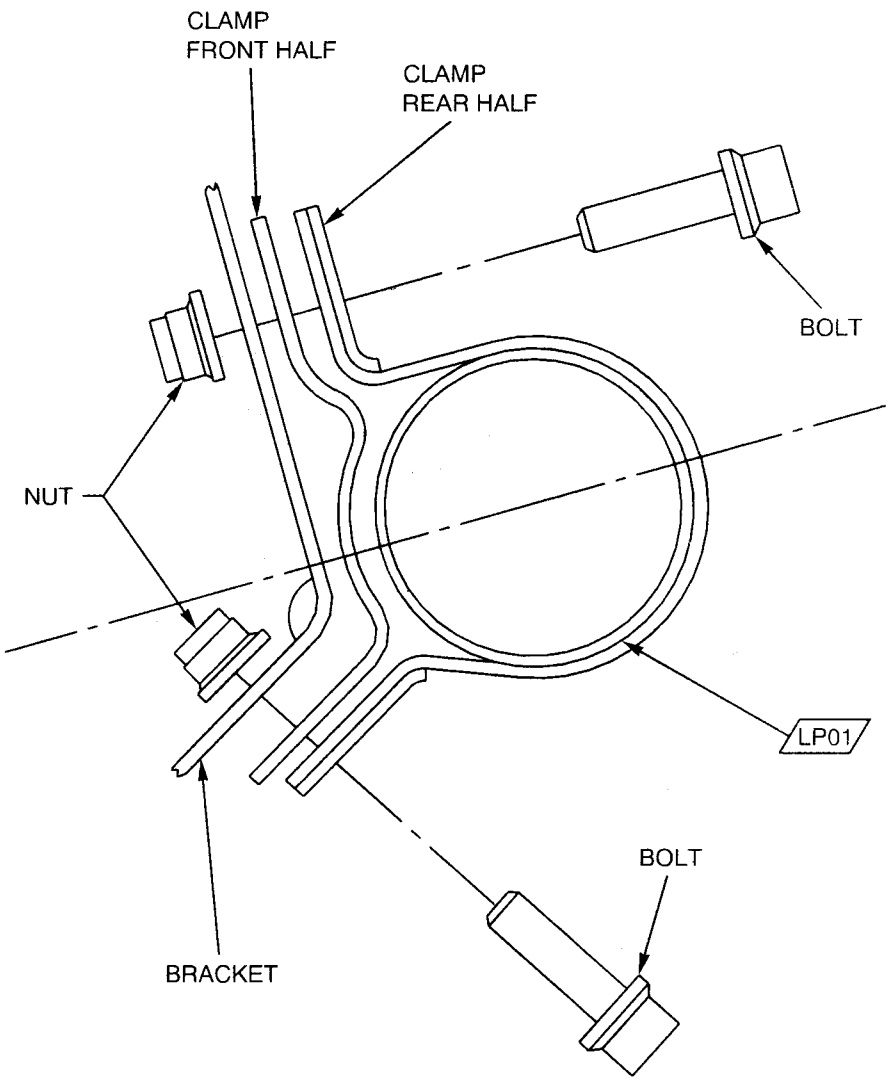


VIEW AE
(ROTATED)

L-B2514 (0000)

BM5 72 65 11 4 KEMK 00

Main Filter Oil Tube (Post SB PW4ENG 79-75) (Sheet 10)
Figure 406

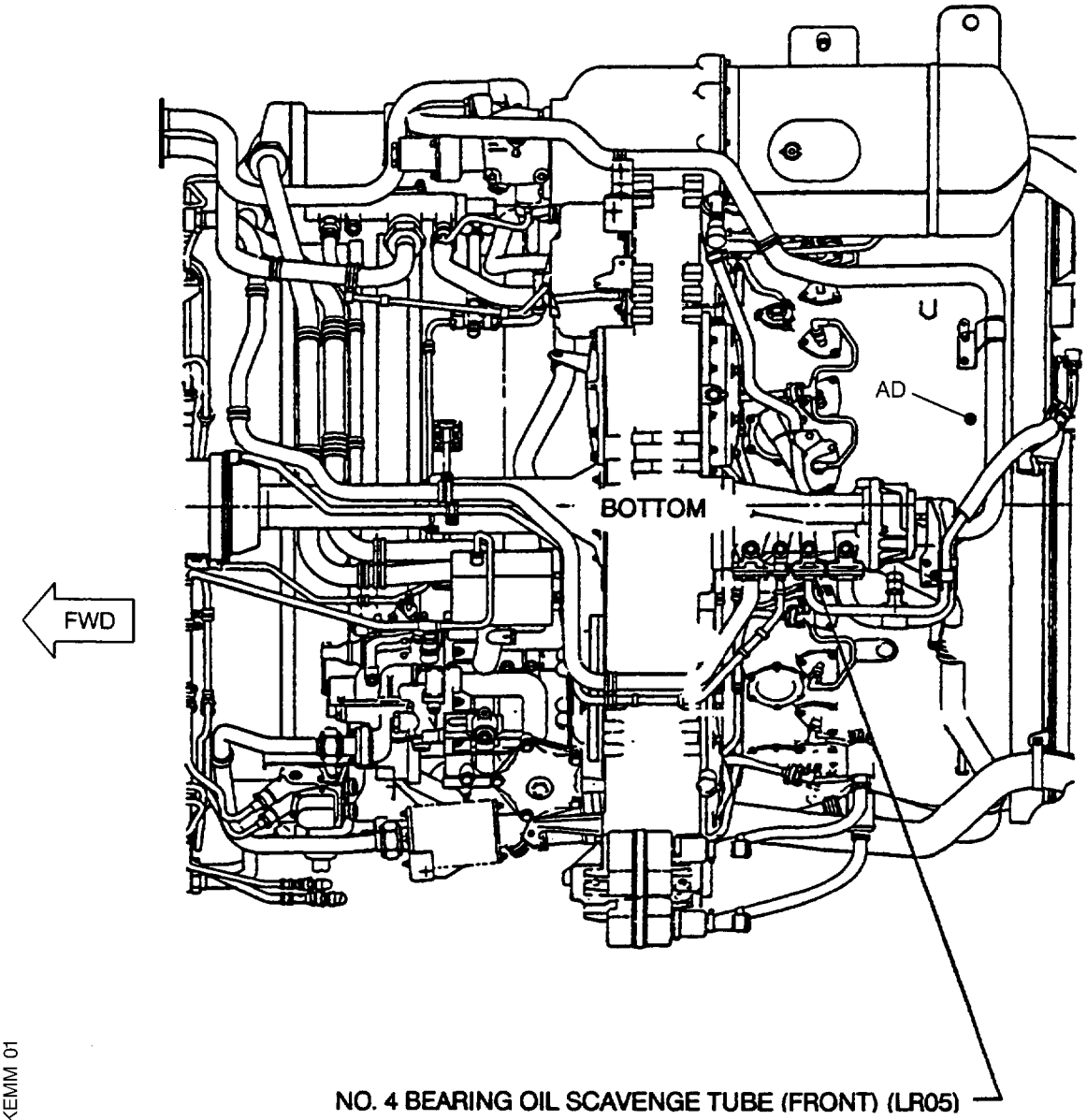


VIEW U

L-B2515 (000
PW

BM5 72 65 11 4 KEML 00

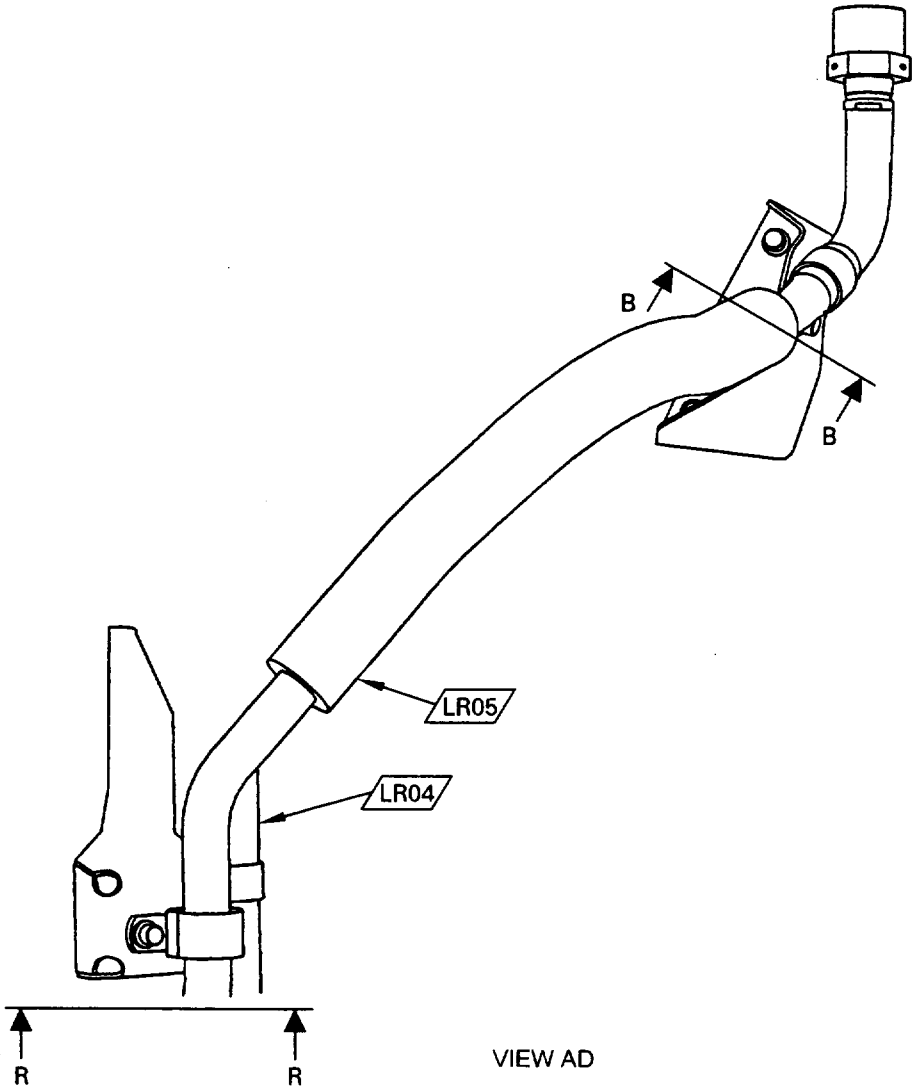
Main Filter Oil Tube (Post SB PW4ENG 79-75) (Sheet 11)
Figure 406



BM5 72 65 11 4 KEMM 01

L-B6570 (0698)

Main Filter Oil Tube (Post SB PW4ENG 79-75) (Sheet 12)
Figure 406

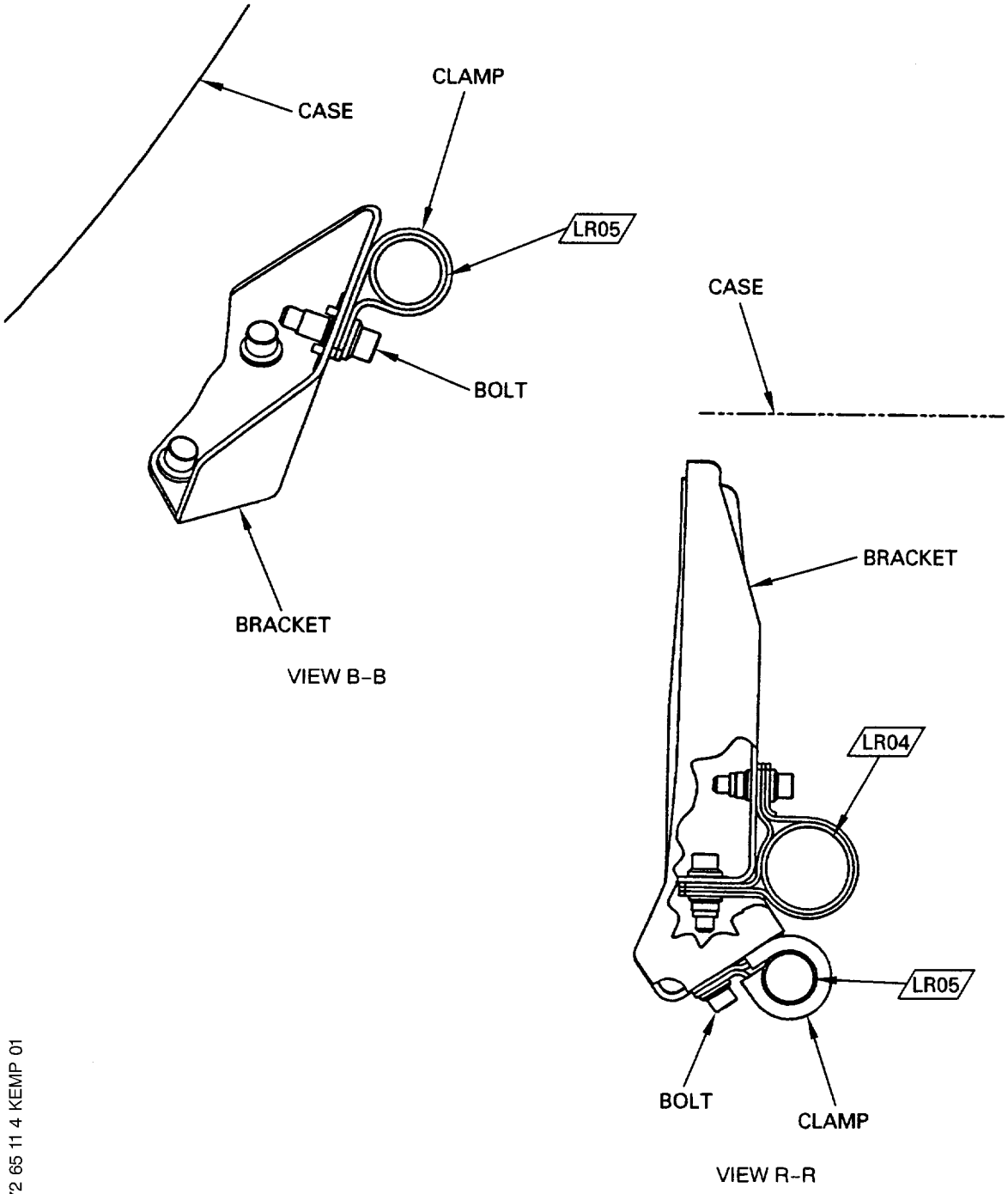


VIEW AD

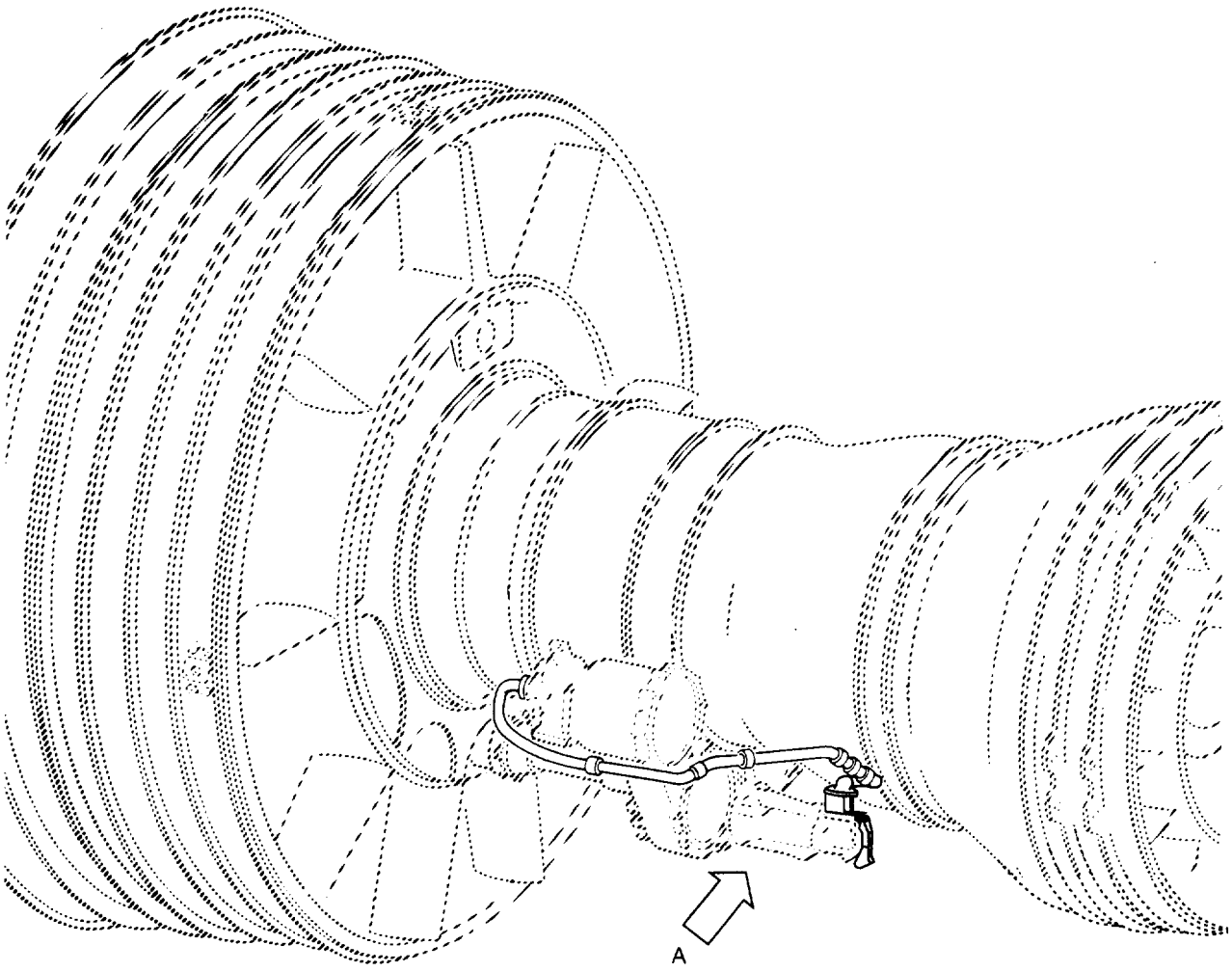
BM5 72 65 11 4 KEMN 01

L-B6571 (0698)

Main Filter Oil Tube (Post SB PW4ENG 79-75) (Sheet 13)
Figure 406



Main Filter Oil Tube (Post SB PW4ENG 79-75) (Sheet 14)
Figure 406

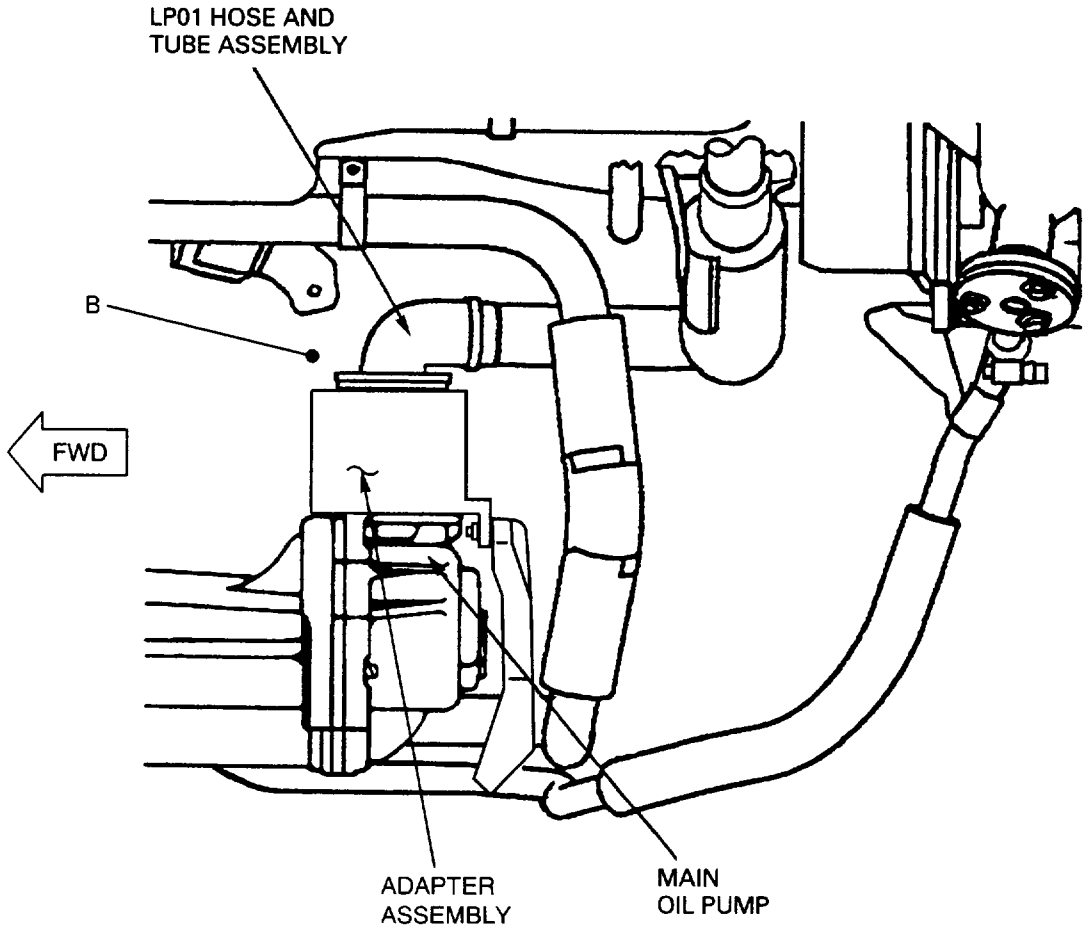


ENGINE LEFT SIDE VIEW

BM5 72 65 11 4 KGMA 00

L-B6567 (0698)

Main Filter Oil Tube (Post SB PW4ENG 79-86) (Sheet 1)
Figure 407

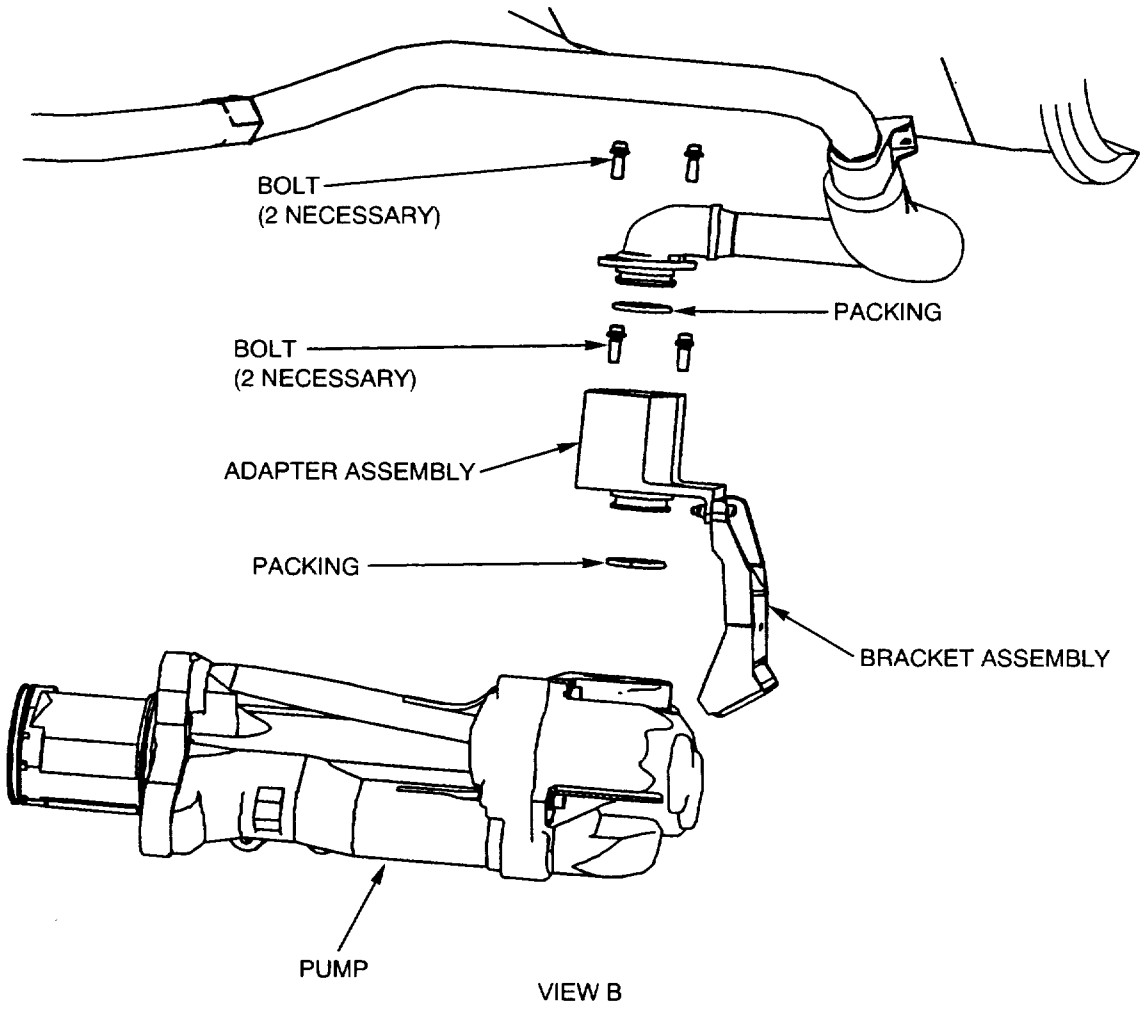


VIEW A

BM5 72 65 11 4 KGMJ 00

L-B6568 (0698)

Main Filter Oil Tube (Post SB PW4ENG 79-86) (Sheet 2)
Figure 407



L-B6569 (0698)

BM5 72 65 11 4 KGMS 00

Main Filter Oil Tube (Post SB PW4ENG 79-86) (Sheet 3)
Figure 407

C. Installation

Pre SB PW4ENG 72-524

(1)If applicable, install the details in the main oil filter housing assembly (MOFH) (3) as follows. (Ref. Fig. 402)(Sheets 1 and 2)

(a)Align bolt hole and position key washer (7) in center of cover (15) with tab of key washer in mating hole in cover. Secure key washer with screw (6), lubricated with Engine Oil (Material No.P03-001). TORQUE screw to between 36 and 40 lbf.in. (0.407 and 0.451 m.daN).

(b)Install spring (5) on key washer (7). Bend tabs of washer out between coils of spring.

(c)Install new packing (8), lubricated with Engine Oil (Material No.P03-001), into groove in OD of main oil strainer cover (15).

(d)Install filter element (4), into opening in bottom of cover (15). Align bolt holes and install cover with filter element into main oil filter housing (3).

NOTE : For this build configuration the removable plug in the outboard end cap of the filter element must be installed before installing the filter element into the cover.

(e)Install the cover (15) as follows.

CAUTION : INCORRECT INSTALLATION OF THIS PART CAUSED AN IN-FLIGHT-SHUTDOWN.
INCORRECT INSTALLATION OF THE COVER CAN CAUSE DAMAGE TO THE PACKING.
DO NOT USE THE COVER RETAINING BOLTS TO PULL THE COVER INTO THE HOUSING. TO DO SO CAN CAUSE DAMAGE TO THE PACKING.

(f)With the cover (15) in position on the housing (3), carefully push the cover on the housing until the flange of the cover touches the housing.

CAUTION : INCORRECT INSTALLATION OF THIS PART CAUSED AN IN-FLIGHT-SHUTDOWN.
BE SURE TO TORQUE THE COVER RETAINING BOLTS TO THE TORQUE SPECIFIED.

(g)Attach the cover (15) with four washers (14) and bolts (13). TORQUE bolts to between 125 and 140 lbf.in. (1.413 and 1.581 m.daN).

(h)Install new packing (9), lubricated with Engine Oil (Material No.P03-001), onto insert (10).

(i)Install insert, lubricated with Engine Oil (Material No.P03-001), into opening in bottom of cover (15) or (21), as appropriate. TORQUE insert to between 200 and 225 lbf.in. (2.260 and 2.542 m.daN).

(j)Install new packing (11), lubricated with Engine Oil (Material No.P03-001), onto plug (12).

(k)Install plug (12), lubricated with Engine Oil (Material No.P03-001), into previously installed insert (10). TORQUE plug to between 110 and 120 lbf.in. (1.243 and 1.355 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to the plug.

Post SB PW4ENG 72-524 and Pre SB PW4ENG 79-79.

(2)If applicable, install the details in the main oil filter housing assembly (MOFH) (3) as follows. (Ref. Fig. 404) (Sheets 1 and 2).

(a)Align bolt hole and position key washer (7) in center of cover (15) with tab of key washer in mating hole in cover. Secure key washer with

screw (6), lubricated with Engine Oil (Material No.P03-001). TORQUE screw to between 36 and 40 lbf.in. (0.407 and 0.451 m.daN).

(b)Install spring (5) on key washer (7). Bend tabs of washer out between coils of spring.

(c)Install new packing (8), lubricated with Engine Oil (Material No.P03-001), into groove in OD of main oil strainer cover (15).

(d)Install filter element (4) into opening in bottom of cover (15). Align bolt holes and install cover with filter element into main oil filter housing (3).

NOTE : For this build configuration, the removable plug in the outboard end cap of the filter element must be installed before installing the filter element into the cover.

(e)Install the cover (15) as follows.

CAUTION : INCORRECT INSTALLATION OF THIS PART CAUSED AN IN-FLIGHT-SHUTDOWN.
INCORRECT INSTALLATION OF THE COVER CAN CAUSE DAMAGE TO THE PACKING.
DO NOT USE THE COVER RETAINING NUTS TO PULL THE COVER INTO THE HOUSING. TO DO SO CAN CAUSE DAMAGE TO THE PACKING.

(f)With the cover (15) in position over the studs in the housing (3), carefully push the cover on the housing until the flange of the cover touches the housing.

CAUTION : INCORRECT INSTALLATION OF THIS PART CAUSED AN IN-FLIGHT-SHUTDOWN.
BE SURE TO TORQUE THE COVER RETAINING NUTS TO THE TORQUE SPECIFIED.

(g)Attach the cover (15) to the housing.

1 If self-locking nuts are used, attach the cover to the housing with four washers (14) and nuts (29). Lubricate the threads with Engine Oil (Material No.P03-001). TORQUE nuts to between 150 and 170 lbf.in. (1.695 and 1.920 m.daN).

2 If hex nuts with lockwire provisions are used, attach the cover to the housing with four washers (14) and nuts (30). Lubricate the threads with Engine Oil (Material No.P03-001). TORQUE nuts to between 125 and 150 lbf.in. (1.413 and 1.694 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to the nuts.

(h)Install new packing (9), lubricated with Engine Oil (Material No.P03-001), onto insert (10).

(i)Install insert, lubricated with Engine Oil (Material No.P03-001), into opening in bottom of cover (15) or (21), as appropriate. TORQUE insert to between 200 and 225 lbf.in. (2.260 and 2.542 m.daN).

(j)Install new packing (11), lubricated with Engine Oil (Material No.P03-001), onto plug (12).

(k)Install plug (12), lubricated with Engine Oil (Material No.P03-001), into previously installed insert (10). TORQUE plug to between 110 and 120 lbf.in. (1.243 and 1.355 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to the plug.

Post SB PW4ENG 72-524 and Post SB PW4ENG 79-79.

(3)If applicable, install the details in the main oil filter housing

assembly (MOFH) (3) as follows. (Ref. Fig. 405) (Sheets 1 and 2).

(a)Install the spring (5) in the spring retainer (23).

(b)Install two screws (22) through the spring retainer screw holes and then install two washers (20) on the ends of the two screws.

(c)Lubricate the threads of the two screws (22) with Engine Oil (Material No.P03-001).

(d)With the spring (5) in place in the spring retainer (23), thread the two screws (22) into the main oil strainer cover (21). TORQUE the two screws to between 36 and 40 lbf.in. (0.407 and 0.451 m.daN).

(e)Install new packing (8), lubricated with Engine Oil (Material No.P03-001), into groove in OD of main oil strainer cover (21).

(f)Install filter element (4) into opening in bottom of cover (21). Align bolt holes and install cover with filter element into main oil filter housing (3).

NOTE : For this build configuration, the removable plug in the outboard end cap of the filter element must be removed before installing the filter element into the cover.

(g)Install the cover (21) as follows.

CAUTION : INCORRECT INSTALLATION OF THIS PART CAUSED AN IN-FLIGHT-SHUTDOWN.
INCORRECT INSTALLATION OF THE COVER CAN CAUSE DAMAGE TO THE PACKING.
DO NOT USE THE COVER RETAINING NUTS TO PULL THE COVER INTO THE HOUSING. TO DO SO CAN CAUSE DAMAGE TO THE PACKING.

(h)With the cover (21) in position over the studs in the housing (3), carefully push the cover on the housing until the flange of the cover touches the housing.

CAUTION : INCORRECT INSTALLATION OF THIS PART CAUSED AN IN-FLIGHT-SHUTDOWN.
BE SURE TO TORQUE THE COVER RETAINING NUTS TO THE TORQUE SPECIFIED.

(i)Attach the cover (21) to the housing.

1 If self-locking nuts are used, attach the cover to the housing with four washers (14) and nuts (29). Lubricate the threads with Engine Oil (Material No.P03-001). TORQUE nuts to between 150 and 170 lbf.in. (1.695 and 1.920 m.daN).

2 If hex nuts with lockwire provisions are used, attach the cover to the housing with four washers (14) and nuts (30). Lubricate the threads with Engine Oil (Material No.P03-001). TORQUE nuts to between 125 and 150 lbf.in. (1.413 and 1.694 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to the nuts.

(j)Install new packing (9), lubricated with Engine Oil (Material No.P03-001), onto insert (10).

(k)Install insert, lubricated with Engine Oil (Material No.P03-001), into opening in bottom of cover (15) or (21), as appropriate. TORQUE insert to between 200 and 225 lbf.in. (2.260 and 2.542 m.daN).

(l)Install new packing (11), lubricated with Engine Oil (Material No.P03-001), onto plug (12).

(m)Install plug (12), lubricated with Engine Oil (Material No.P03-001), into previously installed insert (10). TORQUE plug to between 110 and

and 120 lbf.in. (1.243 and 1.355 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to the plug.

End of SB PW4ENG 72-524 and PW4ENG 79-79

(4)Install packings (17) and (18), lubricated with Engine Oil (Material No.P03-001), into grooves in pressure relief valve (filter element) (19). Install valve, threads lubricated with Engine Oil (Material No.P03-001), onto port just above pressure (regulator) relief valve pad (16). TORQUE valve to between 525 and 625 lbf.in. (5.932 and 7.061 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) in the valve.

(5)Install packings (2), lubricated with Engine Oil (Material No.P03-001), onto two inserts (1). Install inserts, lubricated with Engine Oil (Material No.P03-001), into two upper ports (LP4 and LP5) in main oil filter housing (3).
TORQUE inserts to 200 and 225 lbf.in. (2.260 and 2.542 m.daN).

R **ON A/C 101-104,

R Post SB 72-2030 For A/C 101-104,

C. Installation

(1)If applicable, install the details in the main oil filter housing assembly (MOFH) (3) as follows. (Ref. Fig. 403).

(a)Install pressure relief valve (41) in center of cover (42) and attach with retaining ring (40).

(b)Install new packing (8), lubricated with Engine Oil (Material No.P03-001), into groove in OD of main oil strainer cover (42).

(c)Remove the protective closure from the end of the filter element (39).

(d)Install filter element (39) over the pressure relief valve (41) in cover (42). Align bolt holes and dowel pin in the cover with studs and dowel pin hole in main oil filter housing (3), then install cover with filter element into main oil filter housing.

NOTE : For this build configuration, the removable plug in the outboard end cap of the filter element must be removed before installing the filter element into the cover.

(e)Install the cover (42) as follows.

CAUTION : INCORRECT INSTALLATION OF THIS PART CAUSED AN IN-FLIGHT-SHUTDOWN.
INCORRECT INSTALLATION OF THE COVER CAN CAUSE DAMAGE TO THE PACKING.
DO NOT USE THE COVER RETAINING NUTS TO PULL THE COVER INTO THE HOUSING. TO DO SO CAN CAUSE DAMAGE TO THE PACKING.

(f)With the cover (42) in position over the studs and dowel pin hole in the housing, carefully push the cover on the housing until the flange of the cover touches the housing.

CAUTION : INCORRECT INSTALLATION OF THIS PART CAUSED AN IN-FLIGHT-SHUTDOWN.

BE SURE TO TORQUE THE COVER RETAINING NUTS TO THE TORQUE SPECIFIED.

(g)Attach the cover (42) with four washers (14) and nuts (29). TORQUE nuts to between 150 and 170 lbf.in. (1.695 and 1.920 m.daN).

(2)Install new packing (11), lubricated with Engine Oil (Material No.P03-001), onto plug (12).

(3)Install plug (12), lubricated with Engine Oil (Material No.P03-001), into threaded hole in bottom of cover (42). TORQUE plug to between 110 and 120 lbf.in. (1.243 and 1.355 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to the plug.

(4)Install packings (2), lubricated with Engine Oil (Material No.P03-001), onto two inserts (1). Install inserts, lubricated with Engine Oil (Material No.P03-001), into two upper ports in main oil filter housing (3).
TORQUE inserts to between 200 and 225 lbf.in. (2.260 and 2.542 m.daN).

(5)Install packings (17) and (18), lubricated with Engine Oil (Material No.P03-001), into grooves in plug (43). Install plug, threads lubricated with Engine Oil (Material No.P03-001), in port just above pressure (regulator) relief valve pad (16). TORQUE plug to between 525 and 625 lbf.in. (5.932 and 7.061 m.daN). Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) to the plug.

(6)Install packings (2), lubricated with Engine Oil (Material No.P03-001), onto two inserts (1).
Install inserts, lubricated with Engine Oil (Material No.P03-001), into two upper ports (LP4 and LP5) in main oil filter housing (3).
TORQUE inserts to between 200 and 225 lbf.in. (2.260 and 2.542 m.daN).

**ON A/C 101-200,

(6)Install the oil system pressure relief valve (16) as follows.

(a)Lubricate two new packings with Engine Oil (Material No.P03-001).

(b)Install the packings on the valve.

(c)Install the valve in the bottom hole on the forward side of the MOFH.

(d)Put the bracket on the valve.

(e)Attach the valve and bracket to the MOFH with three bolts.

(f)TORQUE the bolts to between 125 and 140 lbf.in. (1.42 and 1.58 m.daN).

(g)Install Lockwire (Material No.P05-289) or Safety Cable (Material No. P05-291) and Safety Cable Ferrule (Material No.P05-292) in the valve.

(7)Install the transfer tubes as follows : (Ref. Fig. 401) (Sheet 5).

(a)For MOFHs that are pre SB PW4 ENG 79-43, apply Engine Oil (Material No.P03-001) to six packings.

(b)For MOFHs that are post SB PW4 ENG 79-43, apply Engine Oil (Material No.P03-001) to four packings.

(c)Install the packings on the transfer tubes.

(d)Install the tubes in the holes in the front of the gearbox.

(8)For MOFHs that are post SB PW4 ENG 79-43, install the anti-siphon tube assembly (Ref. Fig. 401) (Sheet 5).

(a)Find the correct position of the tube assembly as follows :

1 With no packings installed, put the eccentric flange of the tube assembly in the mating counterbore of the MOFH.
2 The fit of the MOFH and the tube assembly is correct if the tube cannot turn much.
3 With the MOFH pointed in the installed position, see the position of the tube assembly.
4 Remove the tube assembly.

(b) Apply Engine Oil (Material No.P03-001) to two packings.
(c) Install the packings on the tube assembly.
(d) Install the tube assembly in the hole in the front of the gearbox.

CAUTION : USE THE CORRECT PART NUMBER MAIN OIL FILTER HOUSING ASSEMBLY. INTERCHANGEABILITY IS AFFECTED. REFER TO SB PW4 ENG 79-43.

(9) Install the MOFH as follows (Ref. Fig. 401) (Sheet 1).
(a) Install the MOFH over the transfer tubes and, if applicable, the anti-siphon tube assembly.
1 As you install the MOFH, turn the anti-siphon tube assembly to be in the same position as before.
2 The tube assembly must correctly seat in the mating hole of the MOFH.
(b) Attach the MOFH to the gearbox with four washers and four bolts.
(c) Do a check of the position of the anti-siphon tube assembly. The end of the tube assembly must be approximately 0.25 in. (6.350 mm) from the top of the gearbox housing.
(d) TORQUE the bolts to between 125 and 140 lbf.in. (1.42 and 1.58 m.daN).

(10) Attach the W3 and W5 wiring harnesses to the bracket on the MOFH as follows : (Ref. Fig. 401) (Sheet 4).
(a) Lubricate with Engine Oil (Material No.P03-001) :
- the threads of a clamp bolt.
(b) With the loop of the clamp up, attach the harnesses to the bracket with the clamp bolt and a nut.
(c) TORQUE the nut to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(11) Connect the air/oil cooler inlet tube assembly (LP02) as follows : (Ref. Fig. 401) (Sheet 1).
(a) Lubricate with Engine Oil (Material No.P03-001) :
- a new packing
- threads of bolts.
(b) Install the packing on the tube.
(c) Install the tube in the "oil-out" hole of the MOFH.
(d) Attach the tube to the MOFH with the bolts.
(e) TORQUE the bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(12) Connect the oil trim pressure tube assembly (LP32) as follows : (Ref. Fig. 401) (Sheet 4).
(a) Lubricate with Engine Oil (Material No.P03-001) :
- a new packing
- the threads of a clamp bolt
- the threads of three other bolts.
(b) Install the packing on the assembly.
(c) Install the clamp bolt in the clamp. Tighten the bolt by hand that that attaches to the bracket behind the fuel/oil cooler.
(d) Install the assembly in the "trim" hole.

(e)Attach the assembly to the MOFH with three bolts. Tighten the bolts by hand.
(f)TORQUE the clamp bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
TORQUE other bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(13)Install the oil cooler bypass valve drain tube assembly (LP20) as follows : (Ref. Fig. 401) (Sheet 4).
(a)Lubricate with Engine Oil (Material No.P03-001) :
- two new packings
- the threads of two bolts.
(b)Install a packing at both ends of the tube.
(c)Install a retainer on the tube at the end with the flange.
(d)Install the tube in the "servo" hole of the MOFH.
(e)Attach the tube to the MOFH with two bolts. Tighten the bolts by hand.
(f)Attach the tube nut to the oil cooler bypass valve. Tighten the tube nut by hand.
(g)TORQUE the bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
TORQUE tube nut to between 65 and 70 lbf.in. (0.73 and 0.79 m.daN).
(h)Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) in the tube nut.

(14)(Pre SB PW4ENG 79-75) Install the main filter oil tube assembly (LP01) as follows : (Ref. Fig. 401) (Sheets 2 and 3).
(a)Lubricate with Antigalling Compound (Material No.P06-003) :
- the threads of two bolts (for the rear end of the tube).
(b)Lubricate with Engine Oil (Material No.P03-001) :
- two new packings,
- the threads of eight other bolts.
(c)Install a packing on each end of the tube.
(d)Install one end of the tube in the "oil-in" hole in the MOFH.
(e)Install the other end of the tube in the top of the lubrication and scavenge oil pump.
(f)Attach the front end of the tube to the MOFH with three bolts. Tighten by hand.
(g)Attach the rear end of the tube and a bracket to the oil pump with two bolts. Tighten by hand.
(h)Attach the tube to brackets on the gearbox with clamp bolts and nuts. Tighten by hand.
(i)Attach the tube to the bracket on the diffuser case with a clamp bolt and nut. Tighten by hand.
(j)Attach the tube to the clamps on the adjacent (LR05) tube just above the oil pump with clamp bolts and nuts. Tighten by hand.
NOTE : Make sure that the (clip-on) loop clamp grommet halves are on the tubes at the correct clamp location (post SB PW4 ENG 79-36 and post SB PW4 ENG 79-46 only). See the clamp views.
(k)TORQUE the nuts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
TORQUE the bolts in the MOFH to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).
TORQUE the bolts in the oil pump to between 62 and 72 lbf.in. (0.70 0.81 m.daN).

(15)(Post SB PW4ENG 79-75) Install the main oil filter hose and tube

assembly (LP01 tube) and, if applicable, the fluid pressure dampener or (Post SB PW4ENG 79-86) adapter as follows (Ref. Fig. 406, 407) :

(a)If applicable, remove the protective closures and install the packing lubricated with Engine Oil (Material No.P03-001), to packing groove on the dampener or adapter.

(b)If applicable, install the dampener or adapter to the top of the main oil pump and hold with bolts, threads lubricated with Engine Oil (Material No.P03-003), to a handtight condition only.

(c)If applicable, install the loop clamp bracket assembly to the dampener or adapter. Use two retainer bolts and nuts to hold the bracket. TORQUE the bolts to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN) (Ref. Fig. 406) (Sheets 5 and 6).

(d)Remove protective closures and install packing lubricated with Engine Oil (Material No.P03-003), to packing groove at each end of oil tube assembly (LP01).

(e)Install one end of tube (LP01) to the forward side of the main oil filter housing with bolts, threads lubricated with Engine Oil (Material No.P03-003), handtight only.

(f)Install the other end of tube (LP01) to the dampener or adapter, threads lubricated with Engine Oil (Material No.P03-003), to a handtight condition only.

(g)Install bolts, threads lubricated with Engine Oil (Material No.P03-003), nuts and clamps securing tube to gearbox brackets, handtight only.

(h)Install bolts, threads lubricated with Engine Oil (Material No.P03-003) on the tube (LP01) which attaches to the diffuser case bracket.

(i)TORQUE all the clamp bolts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(j)If necessary, TORQUE the bolts that hold the dampener or adapter to the top of the main oil pump to between 62 and 72 lbf.in. (0.71 and 0.81 m.daN).

(k)TORQUE the bolts securing the tube (LP01) to the main oil filter housing to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(l)TORQUE the bolts that hold the tube (LP01) to the dampener or adapter to between 62 and 72 lbf.in. (0.71 and 0.81 m.daN).

(m)TORQUE the bolts securing the tube (LP01) to the diffuser case bracket to between 65 and 75 lbf.in. (0.73 and 0.85 m.daN).

R **ON A/C 101-104,

R Post SB 72-2030 For A/C 101-104,

(7)Install the oil system pressure relief valve (16) as follows.

(a)Lubricate two new packings with Engine Oil (Material No.P03-001).

(b)Install the packings on the valve.

(c)Install the valve in the bottom hole on the forward side of the MOFH.

(d)Put the bracket on the valve.

(e)Attach the valve and bracket to the MOFH with three bolts.

(f)TORQUE the bolts to between 125 and 140 lbf.in. (1.42 and 1.58 m.daN).

(g)Install Lockwire (Material No.P05-289) or Safety Cable (Material No. P05-291) and Safety Cable Ferrule (Material No.P05-292) in the valve.

(8)Install the transfer tubes as follows : (Ref. Fig. 401) (Sheet 5).

(a)For MOFHs that are pre SB PW4 ENG 79-43, apply Engine Oil (Material No.P03-001) to six packings.

(b)For MOFHs that are post SB PW4 ENG 79-43, apply Engine Oil (Material No.P03-001) to four packings.

(c)Install the packings on the transfer tubes.

(d)Install the tubes in the holes in the front of the gearbox.

(9)For MOFHs that are post SB PW4 ENG 79-43, install the anti-siphon tube assembly (Ref. Fig. 401) (Sheet 5).

(a)Find the correct position of the tube assembly as follows :

1 With no packings installed, put the eccentric flange of the tube assembly in the mating counterbore of the MOFH.

2 The fit of the MOFH and the tube assembly is correct if the tube cannot turn much.

3 With the MOFH pointed in the installed position, see the position of the tube assembly.

4 Remove the tube assembly.

(b)Apply Engine Oil (Material No.P03-001) to two packings.

(c)Install the packings on the tube assembly.

(d)Install the tube assembly in the hole in the front of the gearbox.

CAUTION : USE THE CORRECT PART NUMBER MAIN OIL FILTER HOUSING ASSEMBLY. INTERCHANGEABILITY IS AFFECTED. REFER TO SB PW4 ENG 79-43.

(10)Install the MOFH as follows (Ref. Fig. 401) (Sheet 1).

(a)Install the MOFH over the transfer tubes and, if applicable, the anti-siphon tube assembly.

1 As you install the MOFH, turn the anti-siphon tube assembly to be in the same position as before.

2 The tube assembly must correctly seat in the mating hole of the MOFH.

(b)Attach the MOFH to the gearbox with four washers and four bolts.

(c)Do a check of the position of the anti-siphon tube assembly. The end of the tube assembly must be approximately 0.25 in. (6.350 mm) from the top of the gearbox housing.

(d)TORQUE the bolts to between 125 and 140 lbf.in. (1.42 and 1.58 m.daN).

(11)Attach the W3 and W5 wiring harnesses to the bracket on the MOFH as follows : (Ref. Fig. 401) (Sheet 4).

(a)Lubricate with Engine Oil (Material No.P03-001) :

- the threads of a clamp bolt.

(b)With the loop of the clamp up, attach the harnesses to the bracket with the clamp bolt and a nut.

(c)TORQUE the nut to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).

(12)Connect the air/oil cooler inlet tube assembly (LP02) as follows : (Ref. Fig. 401) (Sheet 1).

(a)Lubricate with Engine Oil (Material No.P03-001) :

- a new packing
- threads of bolts.

(b)Install the packing on the tube.

(c)Install the tube in the "oil-out" hole of the MOFH.

(d)Attach the tube to the MOFH with the bolts.
(e)TORQUE the bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(13)Connect the oil trim pressure tube assembly (LP32) as follows : (Ref. Fig. 401) (Sheet 4).
(a)Lubricate with Engine Oil (Material No.P03-001) :
- a new packing
- the threads of a clamp bolt
- the threads of three other bolts.
(b)Install the packing on the assembly.
(c)Install the clamp bolt in the clamp. Tighten the bolt by hand that that attaches to the bracket behind the fuel/oil cooler.
(d)Install the assembly in the "trim" hole.
(e)Attach the assembly to the MOFH with three bolts. Tighten the bolts by hand.
(f)TORQUE the clamp bolt to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
TORQUE other bolts to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(14)Install the oil cooler bypass valve drain tube assembly (LP20) as follows : (Ref. Fig. 401) (Sheet 4).
(a)Lubricate with Engine Oil (Material No.P03-001) :
- two new packings
- the threads of two bolts.
(b)Install a packing at both ends of the tube.
(c)Install a retainer on the tube at the end with the flange.
(d)Install the tube in the "servo" hole of the MOFH.
(e)Attach the tube to the MOFH with two bolts. Tighten the bolts by hand.
(f)Attach the tube nut to the oil cooler bypass valve. Tighten the tube nut by hand.
(g)TORQUE the bolts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
TORQUE tube nut to between 65 and 70 lbf.in. (0.73 and 0.79 m.daN).
(h)Install Lockwire (Material No.P05-289) or Safety Cable (Material No.P05-291) and Safety Cable Ferrule (Material No.P05-292) in the tube nut.

(15)(Pre SB PW4ENG 79-75) Install the main filter oil tube assembly (LP01) as follows : (Ref. Fig. 401) (Sheets 2 and 3).
(a)Lubricate with Antigalling Compound (Material No.P06-003) :
- the threads of two bolts (for the rear end of the tube).
(b)Lubricate with Engine Oil (Material No.P03-001) :
- two new packings,
- the threads of eight other bolts.
(c)Install a packing on each end of the tube.
(d)Install one end of the tube in the "oil-in" hole in the MOFH.
(e)Install the other end of the tube in the top of the lubrication and scavenge oil pump.
(f)Attach the front end of the tube to the MOFH with three bolts. Tighten by hand.
(g)Attach the rear end of the tube and a bracket to the oil pump with two bolts. Tighten by hand.
(h)Attach the tube to brackets on the gearbox with clamp bolts and nuts. Tighten by hand.
(i)Attach the tube to the bracket on the diffuser case with a clamp bolt

and nut. Tighten by hand.

(j)Attach the tube to the clamps on the adjacent (LR05) tube just above the oil pump with clamp bolts and nuts. Tighten by hand.

NOTE : Make sure that the (clip-on) loop clamp grommet halves are on the tubes at the correct clamp location (post SB PW4 ENG 79-36 and post SB PW4 ENG 79-46 only). See the clamp views.

(k)TORQUE the nuts to between 36 and 40 lbf.in. (0.41 and 0.45 m.daN).
TORQUE the bolts in the MOFH to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).
TORQUE the bolts in the oil pump to between 62 and 72 lbf.in. (0.70 0.81 m.daN).

(16)(Post SB PW4ENG 79-75) Install the main oil filter hose and tube assembly (LP01 tube) and, if applicable, the fluid pressure dampener or (Post SB PW4ENG 79-86) adapter as follows (Ref. Fig. 406, 407) :

(a)If applicable, remove the protective closures and install the packing lubricated with Engine Oil (Material No.P03-001), to packing groove on the dampener or adapter.

(b)If applicable, install the dampener or adapter to the top of the main oil pump and hold with bolts, threads lubricated with Engine Oil (Material No.P03-003), to a handtight condition only.

(c)If applicable, install the loop clamp bracket assembly to the dampener or adapter. Use two retainer bolts and nuts to hold the bracket. TORQUE the bolts to between 32 and 36 lbf.in. (0.37 and 0.40 m.daN) (Ref. Fig. 406) (Sheets 5 and 6).

(d)Remove protective closures and install packing lubricated with Engine Oil (Material No.P03-003), to packing groove at each end of oil tube assembly (LP01).

(e)Install one end of tube (LP01) to the forward side of the main oil filter housing with bolts, threads lubricated with Engine Oil (Material No.P03-003), handtight only.

(f)Install the other end of tube (LP01) to the dampener or adapter, threads lubricated with Engine Oil (Material No.P03-003), to a handtight condition only.

(g)Install bolts, threads lubricated with Engine Oil (Material No.P03-003), nuts and clamps securing tube to gearbox brackets, handtight only.

(h)Install bolts, threads lubricated with Engine Oil (Material No.P03-003) on the tube (LP01) which attaches to the diffuser case bracket.

(i)TORQUE all the clamp bolts to between 32 and 36 lbf.in. (0.36 and 0.41 m.daN).

(j)If necessary, TORQUE the bolts that hold the dampener or adapter to the top of the main oil pump to between 62 and 72 lbf.in. (0.71 and 0.81 m.daN).

(k)TORQUE the bolts securing the tube (LP01) to the main oil filter housing to between 85 and 95 lbf.in. (0.96 and 1.07 m.daN).

(l)TORQUE the bolts that hold the tube (LP01) to the dampener or adapter to between 62 and 72 lbf.in. (0.71 and 0.81 m.daN).

(m)TORQUE the bolts securing the tube (LP01) to the diffuser case bracket to between 65 and 75 lbf.in.(0.73 and 0.85 m.daN).

**ON A/C 101-200,

D. Close-up and Test
(1)Install oil pressure switch tube assemblies.
(2)Make certain that working area is clean and clear of tools and miscellaneous items of equipment.
(3)Close left thrust reverser doors (Ref. 71-13-00, P. Block 301).
(4)Service Engine Oil System (Ref. 12-13-79, P. Block 1).
(5)Test engine per Test Reference Table (Ref. 71-00-00, P. Block 501).

FADEC ALTERNATOR DRIVE GEARSHAFT AND BEARINGS ASSEMBLY - REMOVAL/INSTALLATION

1. Equipment and Materials

ITEM	DESIGNATION
A.	Packings
B.	Circuit Breaker Safety Clips
C.	Lockwire (AS3214-02)
D. PWA12126	Base
E. PWA85273	Drift
F. PWA85274	Plate
G. PWA86086	Puller
H. PWA80130	Gage, Force
J. PWA85267	Base (Optional to PWA88683)
K. PWA85348	Drift, Assembly
L. PWA86087	Drift, Hand
M. PWA88683	Base
N. Material No.P03-001	Oils (Ref. 70-00-00)
Referenced Procedures	
- 70-00-00, P. Block 201	Maintenance Pratices
- 71-00-00, P. Block 501	Power Plant - General
- 71-13-00, P. Block 301	Cowl Doors
- 72-65-05, P. Block 401	FADEC Alternator Drive Oil Seal Assembly
- 73-24-01, P. Block 401	Permanent Magnet Alternator

2. Job Set-Up

A. Open, safety and tag circuit breakers for the appropriate engine and open fan and thrust reverser cowl doors (Ref. 71-13-00, P. Block 301).

B. Remove the permanent magnet alternator stator (Ref. 73-24-01, P. Block 401).

C. Remove the permanent magnet alternator rotor (Ref. 73-24-01, P. Block 401).

D. Remove the FADEC alternator drive oil seal assembly (Ref. 72-65-05, P. Block 401).

3. Procedure

A. Remove and disassemble the FADEC alternator drive gearshaft and bearings assembly.

(1)Remove the FADEC alternator drive gearshaft and bearings assembly from the main gearbox. (Ref. Fig. 401)

(a)(Pre SB PW4ENG 75-59) Remove the three bolts (1), washers (2), and bracket (7) that attach the FADEC alternator drive gearshaft and bearings assembly (3) to the FADEC alternator drive pad (5). Remove the assembly from the gearbox. Discard the packing (4).

(b)(Post SB PW4ENG 75-59) Remove the three bolts (1) that attach the FADEC

alternator drive gearshaft and bearings assembly (3) to the FADEC alternator drive pad (5). Remove the assembly from the gearbox. Discard the packing (4).

(2)Disassemble the FADEC alternator drive gearshaft and bearings assembly. (Ref. Fig. 402)

(a)Remove the FADEC alternator rotor sleeve spacer (16).

(b)Discard the packing (15) from the gearshaft.

(c)With PWA86086 Puller, remove the bearing seal seat (1).

CAUTION : YOU MUST KEEP THE DETAILS OF THE BEARING TOGETHER.

(d)Remove the two bolts (14) that attach the bearing outer race (13) to the generator housing (3).

(e)Put the halves of PWA85274 plate under the mounting flange of the housing (3). Put the gearshaft and bearings assembly, gear end down, into PWA12126 Base. With PWA85273 Drift and an arbor press, push the gearshaft out of the upper bearing. Remove the bearing inner race and rollers (2) from the gearshaft. Remove the bearing outer race (13) from the housing. Put the bearing in a container with a label.

(f)Carefully remove the housing (3) from the gearshaft (6). Make sure that the gearshaft and inner race does not suddenly fall out of the bearing outer race (8). Remove the gearshaft and bearing inner race from the base. Remove the bearing spacer (4) from the gearshaft.

CAUTION : YOU MUST KEEP THE DETAILS OF THE BEARING TOGETHER.

(g)Put the halves of PWA85274 Plate under the bearing inner race and rollers (5). Put the gearshaft (6), gear end down, into PWA12126 Base. With PWA85723 Drift and an arbor press, push the gearshaft out of the lower inner race and rollers.

(h)Remove the two bolts (7) that attach the bearing outer race (8) to the gearshaft housing. Remove the bearing outer race.

(j)Remove lockwire, the plug (11), and insert (12) from the hole at the bottom of the housing. Discard the packings (9) and (10).

B. Assemble and install the FADEC alternator drive gearshaft and bearings assembly.

(1)Assemble the FADEC alternator drive gearshaft and bearings assembly. (Ref. Fig. 402)

(a)Heat the bearing inner race and rollers (2) and (5) in an oil bath (Ref. 70-00-00, P. Block 201).

CAUTION : YOU MUST KEEP ALL DETAILS OF THE BEARING TOGETHER.

(b)Put the gearshaft (6), gear end down, into PWA85267 or PWA88683 Base. Remove the inner race and rollers (5) from the oil bath and put it on the lower bearing journal of the gearshaft.

(c)With PWA85348 Drift, PWA80130 Force Gage, and an arbor press, put a load of 1500 lbf. (680.39 kg) on the bearing. Remove the drift.

(d)Attach the bearing outer race (8) to the generator housing (3) with two bolts (7). TORQUE the bolts to between 27 and 30 lbf.in. (0.31 and 0.33 m.daN).

(e)Carefully install the gearshaft in the housing, and at the same time install the bearing rollers in the mating outer race installed in the housing.

(f)Install the bearing spacer (4) on the gearshaft until it touches against the bearing inner race.

CAUTION : YOU MUST KEEP ALL DETAILS OF THE BEARING TOGETHER.

(g)Attach the bearing outer race (13) to the housing with two bolts (14). TORQUE the bolts to between 27 and 30 lbf.in. (0.31 and 0.33 m.daN).

(h)Remove the bearing inner race and rollers (2) from the oil bath. Install the inner race and rollers on the upper bearing journal of the gearshaft. At the same time, install the rollers with the mating outer race installed on the housing.

(j)With PWA85348 Drift, PWA80130 Force Gage, and an arbor press, put a load of 1500 lbf. (680.39 kg) on the bearing. Remove the drift.

CAUTION : TO AVOID THE INCORRECT INSTALLATION OF THE BEARING SEAL SEAT ON THE GEARSHAFT, THE SMALLER RADIAL SURFACE OF THE SEAL SEAT SHOULD TOUCH THE BEARING INNER RACE.

(k)Position correctly the bearing seal seat on the gearshaft to touch against the bearing inner race (Ref. Fig. 403). If necessary, use PWA86087 Drift.

(l)Install new packing (15), lubricated with Material No.P03-001 in the groove on the gearshaft.

(m)Install the FADEC alternator rotor sleeve spacer (16) on the gearshaft to touch against the bearing seal seat. If necessary, use PWA86087 Drift.

(n)Install new packing (9), lubricated with Material No.P03-001, on the insert (12). Install the insert, lubricated with Material No.P03-001 in the hole in the OD of the housing. TORQUE the insert to between 150 and 170 lbf.in. (1.70 and 1.92 m.daN).

(p)Install new packing (10), lubricated with Material No.P03-001, on the plug (11). Install the plug, lubricated with Material No.P03-001 in the insert installed in the housing. TORQUE the plug to between 65 and 75 lbf.in. (0.74 and 0.84 m.daN). Wirelock the plug.

(2)Install the FADEC alternator drive gearshaft and bearings assembly on the main gearbox.

(a)Apply a layer of Material No.P03-001 to the ID of the gearbox mount pad (5).

(b)Install packing (4), lubricated with Material No.P03-001 in the groove in the OD of the FADEC alternator drive gearshaft and bearings assembly (3)

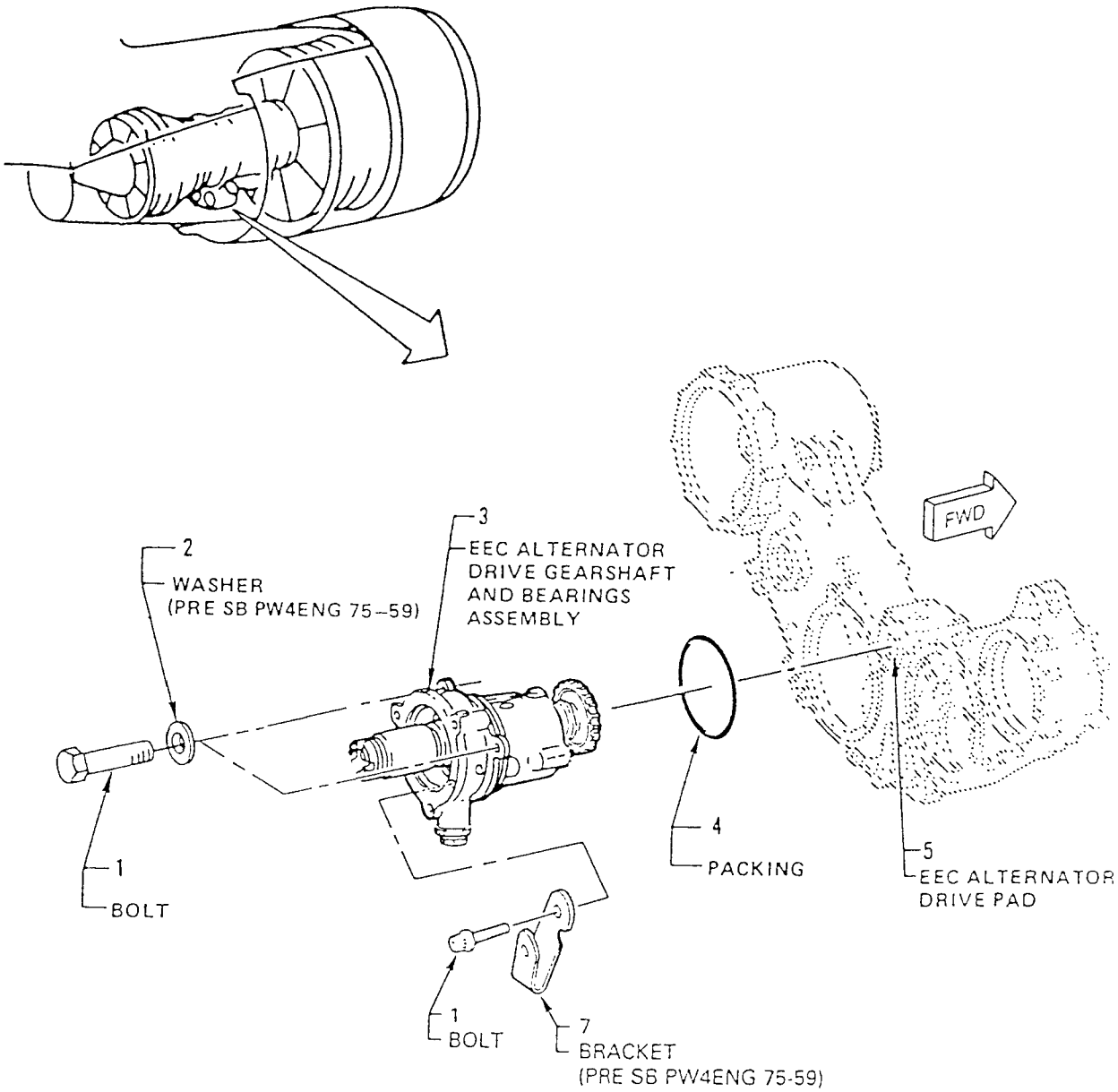
(c)Install the FADEC alternator drive gearshaft and bearing assembly (3), gear end first, into the FADEC alternator drive pad (5). Mesh the gears. Be sure the housing touches the drive pad.

(d)(Pre SB PW4ENG 75-59). Attach the assembly to the main gearbox with three bolts (1), two washers (2), and a bracket (7).

(e)(Post SB PW4ENG 75-59). Attach the assembly to the main gearbox with three bolts (1).

(f)TORQUE the bolts to between 62 and 72 lbf.in. (0.71 and 0.81 m.daN).

(g)Do a check of the clearance between the gearshaft housing and the main gearbox. Use a 0.003 in. (0.076 mm) feeler gage. If it is possible to put the gage between the housing and the main gearbox, the housing is not correctly installed. Do a check of the torque on the mounting bolts. If the bolts are at maximum torque, but the housing is not correctly installed, remove the gearshaft and bearings assembly and install the assembly again.



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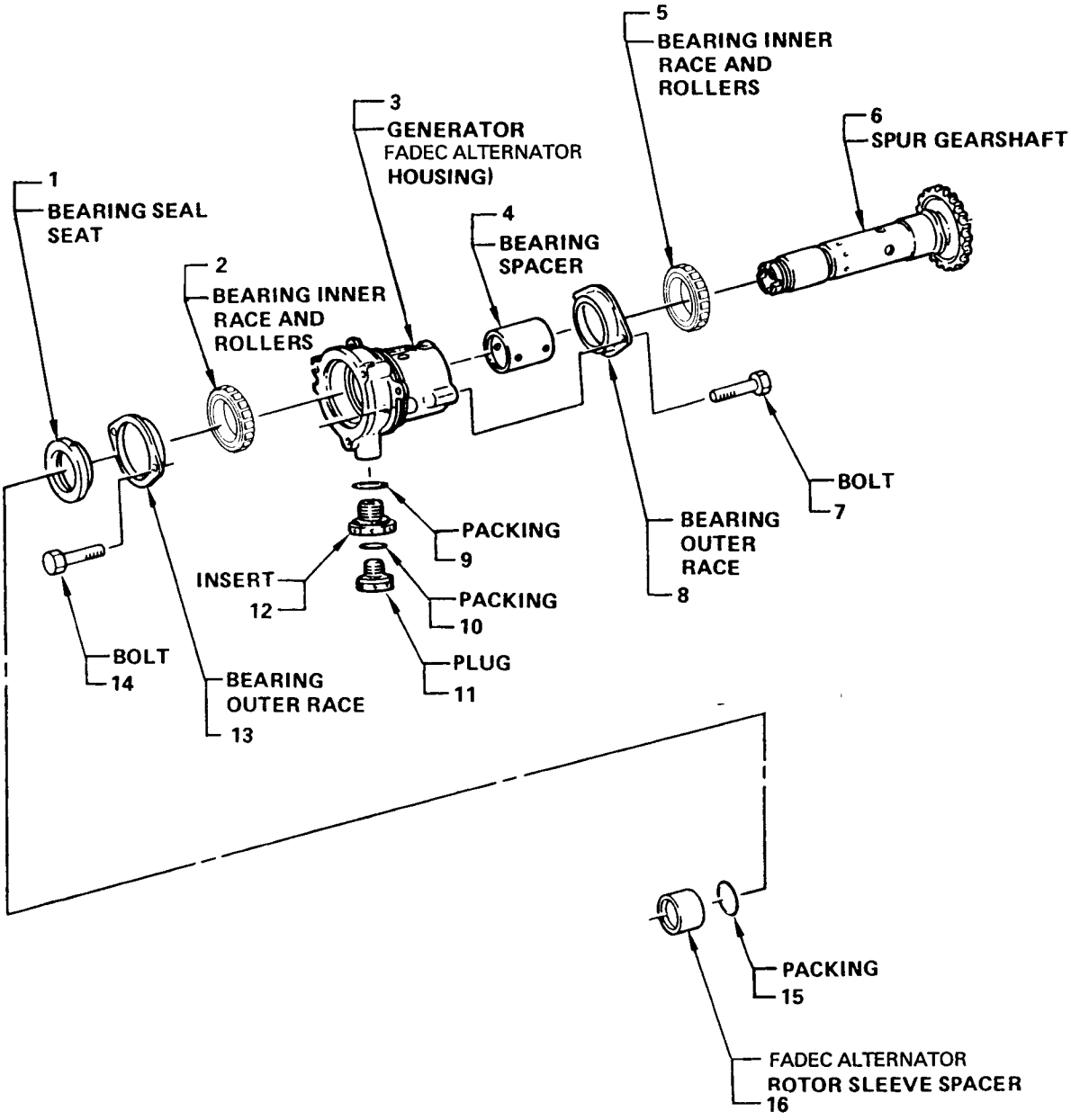
FADEC Alternator Drive Gearshaft and
Bearings Assembly Location
Figure 401



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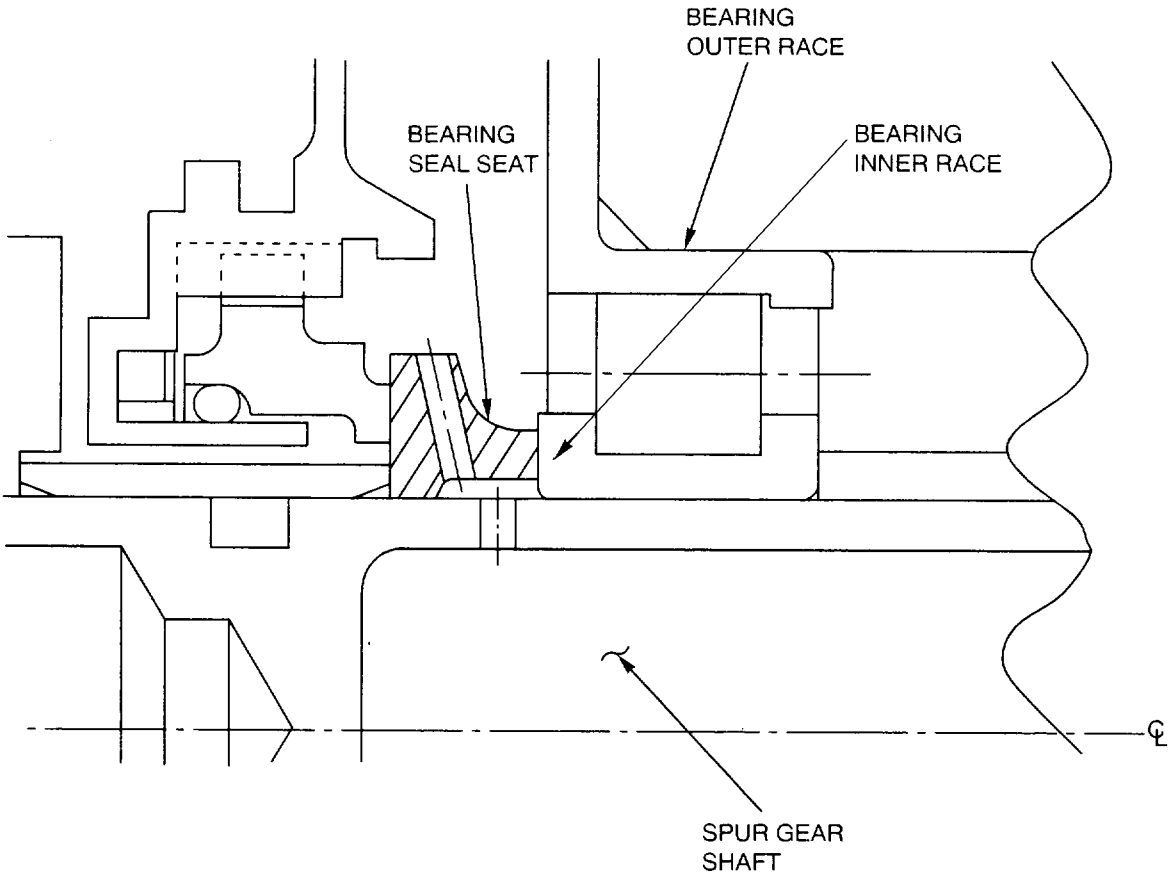
FADEC Alternator Drive Gearshaft and
Bearings Assembly Details
Figure 402



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PW V

FADEC/PMA Alternator Drive Gearshaft and Bearings
Assembly - Bearing Seal Seat Installation
Figure 403

4. Close-Up and Test

A. Install the FADEC alternator drive oil seal assembly (Ref. 72-65-05, P. Block 401).

B. Install the permanent magnet alternator rotor (Ref. 73-24-01, P. Block 401).

C. Install the permanent magnet alternator stator (Ref. 73-24-01, P. Block 401).

D. Close thrust reverser cowl doors, remove safety clips and tags and close circuit breakers (Ref. 71-13-00, P. Block 301).